SET # _____

PROJECT

SOUTH TEXAS COLLEGE

PECAN CAMPUS BUILDING H RENOVATION FOR CULINARY ARTS

RFP # 19-20-1008

REGISTERED ARCHITECT
EDUARDO G. VELA
14407
STATE OF TEXAS

SEP 16 2019

EGV
ARCHITECTS, INC.
P.O. Box 8627
220 S. Bridge Street
Hidalgo, TX 78557
Phone: (956) 843-2987
Fax: (956) 843-9726

SPECIFICATIONS FOR PECAN CAMPUS
BUILDING H RENOVATIONS FOR CULINARY ARTS - RFP #19-20-1008

TABLE OF CONTENTS

REQUEST FOR PROPOSALS

South Texas College (STC) is accepting Competitive Sealed Proposals for the following project:

PROJECT NAME:	Pecan Campus – Building H Renovation for Culinary Arts PROJECT No. 19-20-1008
PRE-PROPOSAL CONFERENCE TIME & LOCATION:	10:00 a.m., September 26, 2019 STC Purchasing Department 3200 W. Pecan Blvd, Bldg. N, Ste. 142 McAllen, Texas 78501
PROPOSAL DEADLINE & SUBMITTAL LOCATION:	2:00 p.m., October 3, 2019 STC Purchasing Department 3200 W. Pecan Blvd, Bldg. N, Ste. 145 McAllen, Texas

RFP packages will be available beginning on September 16, 2019. RFP packages may be obtained from RGV Reprographics located 519 S. Broadway, McAllen, Texas (PH: 956-686-1525) upon the deposit of a refundable check in the amount of $100.00 payable to South Texas College. The deposit check will be returned if project plans are returned, in good condition, within 10 days after the proposals deadline.

Proposals shall be accompanied by a Certified or Cashier's Check or acceptable bidder's bond, payable to South Texas College, in an amount not less than five (5%) percent of the proposed project amount.

Proposals received after the specified time and date will not be considered and will be returned unopened. Facsimile responses will not be accepted. All proposals must be submitted in a sealed envelope. Responses need to be clearly marked on the envelope with the RFP number and name of the project.

South Texas College is an equal education and equal employment opportunity/affirmative action employer. As an equal opportunity employer, the College does not discriminate on the basis of race, color, national origin, religion, age, sex, sexual orientation, gender, gender identity, disability, genetic information, or veteran status.

South Texas College
PURCHASING DEPARTMENT
P. O. BOX 9500
MCALLEN, TX 78502-9500

REQUEST FOR COMPETITIVE SEALED PROPOSALS

RFP NUMBER
RFP 19-20-1008

PROPOSAL MUST BE RECEIVED BEFORE:
October 3, 2019 @ 2:00 PM

Hand Deliver or Express Mail to:
South Texas College
Purchasing Department
3200 W. Pecan Blvd, Bldg N, Ste 145
McAllen, TX 78501

Show RFP Number, Opening Date and Time on Return Envelope

NOTE: Responses must be time stamped at **South Texas College Purchasing Department** before the hour and date specified for receipt of responses.

Responses must be submitted in a sealed envelope plainly marked with the name and address of the responding entity. The response envelope must contain the following: PECAN CAMPUS BUILDING H RENOVATION FOR CULINARY ARTS, the RFP number, plus the due date and time.

TABLE OF CONTENTS

SECTION 1
NOTICE TO RESPONDENTS

1.1 General

South Texas College ("STC") is accepting competitive sealed proposals for the Pecan Campus – Building H Renovation for Culinary Arts project in accordance with the terms, conditions and requirements set forth in this Request for Proposals ("RFP"), RFP No. 19-20-1008.

1.2 Submittal Deadline

STC will accept proposals for selection until 2:00 pm, October 3, 2019.

1.3 STC Contacts

Any questions or concerning the drawings and specifications for this Request for Proposal shall be directed to:

EGV Architects
220 S. Bridge St.
Hidalgo, Texas 78557
Email: edvela@flash.net
Phone: 956-843-2987

Any questions or concerns regarding the Request for Proposal document and selection process shall be directed to:

Deyadira Leal, Construction Buyer
3200 W. Pecan Blvd. Bldg. N
McAllen, Texas 78596
Email: daleal@southtexascollege.edu
Phone: 956-872-4686

STC specifically requests that Respondents restrict all contact and questions regarding this RFP to the above named individual(s).

1.4 Estimated Budget

The estimated budget for the project is $500,000.

1.5 Type of Contract

The Agreement for the project will be the Standard Form of Agreement between STC and the Contractor, AIA Documents A101-2017 and A201-2007, as modified. Copies of the AIA Contract Documents are attached hereto.

1.6 Inquiries and Interpretations

Responses to inquiries which directly effect an interpretation or change to this RFP will be issued in writing by addendum (amendment) and mailed to all parties recorded by STC as having received a copy of the RFP. All such addenda issued by STC prior to the time that proposals are received shall be considered part of the RFP, and the Respondent shall be required to consider and acknowledge receipt of such in his proposal.

Only those inquiries STC replies to which are made by formal written addenda shall be binding. Oral and other interpretations or clarification will be without legal effect. The Respondent must acknowledge all addenda. Such acknowledgment must be received prior to the hour and date specified for receipt of proposals, or shall accompany the proposal.

1.7 Public Information

STC considers all information, documentation and other materials requested to be submitted in response to this solicitation to be of a non-confidential and/or non-proprietary nature and therefore shall be subject to public disclosure under the Texas Public Information Act (*Texas Government Code*, Chapter 552.001, *et seq.*) after a contract is awarded.

Respondents are hereby notified that STC strictly adheres to all statutes, court decisions, and opinions of the Texas Attorney General with respect to disclosure of RFP information.

1.8 Contract Award Process

STC reserves the right to award a Contract for all or any portion of the requirements proposed by reason of this request, or to reject any and all proposals if deemed to be in the best interests of STC and to re-solicit for proposals, or to reject any and all proposals if deemed to be in the best interests of STC and to temporarily or permanently abandon the procurement. If the STC awards a contract, it will award the contract to the offeror(s) whose proposal is the most advantageous to STC and offers the best value, considering price and the evaluation factors set forth in this RFP.

Proposals will be opened publicly to identify the names of the Respondents, and the monetary proposals. Other contents of the proposals will be afforded security sufficient to preclude disclosure of the contents of the proposal prior to award. STC will evaluate and rank each proposal with respect to the selection criteria contained in this RFP. After opening and ranking, an award may be made on the basis of the proposals initially submitted, without discussion, clarification or modification, or, STC may discuss with the selected Respondent offers for cost reduction and other elements of the Respondent's proposal. If STC determines that it is unable to reach a contract satisfactory to STC with the selected Respondent, then STC will terminate discussions with the selected Respondent and proceed to the next Respondent in order of selection ranking until a contract is reached or STC has rejected all proposals. STC may not disclose any information derived from the proposals submitted from competing offers in conducting such discussions.

1.9 Criteria for Selection

The Respondent selected for an award will be the Respondent whose proposal, as presented in the response to this RFP, is the most advantageous to STC. STC is not bound to accept the lowest priced proposal if that proposal is not in the best interest of STC as determined by STC.

The criteria for evaluation of proposals, and selection of the successful respondent for this award, will be based on the factors listed below:

1. The Respondent's price proposal
   45 Points

2. The Respondent's experience and reputation.
   10 Points

3. The quality of the Respondent's goods or services
   10 Points

4. The Respondent's safety record
   5 Points

5. The Respondent's proposed personnel
   8 Points

6. The Respondent's financial capability in relation to the size and scope of the project
   9 Points

7. The Respondent's organization and approach to the project
   6 Points

8. The Respondent's time frame for completing the project
   7 Points

1.10 Key Events Schedule

Issue Request for Proposal	September 16, 2019
Pre-Proposal Conference	September 26, 2019 @ 10:00 a.m. Pecan Campus, Building N 142 3200 W. Pecan Blvd. McAllen, Texas 78501
Proposal Submittal Deadline	October 3, 2019 @ 2:00 p.m. Pecan Campus, Building N 145 3200 W. Pecan Blvd. McAllen, Texas 78501

SECTION 2
PROPOSAL REQUIREMENTS

2.1 General Instructions

A. Respondents should carefully read the information contained herein, and the Design Criteria Package, and submit a complete response to all requirements and questions as directed.

B. Proposals and any other information submitted by Respondents in response to this Request for Proposal shall become the property of STC.

C. STC will not provide compensation to Respondents for any expenses incurred by the Respondent(s) for proposal preparation or for any demonstrations that may be made, unless otherwise expressly stated or required by law. Respondents submit proposals at their own risk and expense.

D. Proposals which are qualified with conditional clauses, or alterations, or items not called for in the RFP documents, or irregularities of any kind are subject to disqualification by STC, at its option.

E. Each proposal should be prepared simply and economically, providing a straightforward, concise description of your firm's ability to meet the requirements of this RFP. Emphasis should be on completeness, clarity of content, responsiveness to the requirements, and an understanding of STC's needs.

F. STC makes no guarantee that an award will be made as a result of this RFP, and reserves the right to accept or reject any or all proposals, waive any formalities or minor technical inconsistencies, or delete any item/requirements from this RFP or resulting contract when deemed to be in STC's best interest. Representations made within the proposal will be binding on responding firms. STC will not be bound to act by any previous communication or proposal submitted by the firms other than this RFP.

G. Firms wishing to submit a “No-Response” are requested to return the first page of the Execution of Offer (ref. Section 3). The returned form should indicate your company's name and include the words “No-Response” in the right-hand column.

2.2 Preparation and Submittal Instructions

A. Responses to this RFP shall include answers to required questions in Section 6 Respondent Questionnaire. It is not necessary to repeat the question in your response; however, it is essential that you reference the question number with your response corresponding accordingly. In cases where a question does not apply or if unable to respond, reference the question number and indicate N/A (Not Applicable) or N/R (No Response), as appropriate.

B. Page Size, Binders and Dividers

Proposals must be typed or printed on letter-size (8-1/2” x 11”) paper. STC requests that proposals be submitted in a binder. Preprinted material should be referenced in the proposal and included as labeled attachments.

C. Table of Contents

Include with the proposal a Table of Contents that includes page number references. The Table of Contents should be in sufficient detail to facilitate easy reference of the sections of the proposal as well as separate attachments (which should be included in the main Table of Contents). Supplemental information and attachments included by your firm (i.e., not required) should be clearly identified in the Table of Contents and provided as a separate section.

D. Pagination

All pages of the proposal should be numbered sequentially in Arabic numerals (1, 2, 3, etc.) Attachments should be numbered or referenced separately.

E. Number of Copies

Submit a total of three (3) complete copies of the entire response. An original signature must appear on the Execution of Offer (ref. Section 3) of at least one (1) copy submitted.

F. Submission

1. Three (3) identical copies of the proposal including any supplemental printed material referenced with the RFP, must be submitted and received in the STC Purchasing Department on or before the time and date specified, pursuant to the Notice to Respondents (ref. Subsection 1.2) and delivered to:

   South Texas College
   Purchasing Department
   3200 W. Pecan Blvd, Bldg N, Ste 145
   McAllen, TX 78501

2. The materials submitted must be enclosed in a sealed envelope (box or container); the package must show clearly the submittal deadline; the RFP number must be clearly visible; and name and the return address of the Respondent must be clearly visible.

3. Late proposals properly identified will be returned to Respondent unopened. Late proposals will not be considered under any circumstances.

4. Telephone proposals are not acceptable when in response to the Request for Proposal.

5. Facsimile ("FAX") proposals are not acceptable when in response to this Request for Proposal.

G. Withdrawal or Modification

No proposal may be changed, amended, modified by telegram or otherwise, after the same has been submitted or filed in response to this solicitation, except for obvious errors in extension. However, a proposal may be withdrawn and resubmitted any time prior to the time set for receipt of proposals. No proposal may be withdrawn after the submittal deadline without approval by STC, which shall be based on Respondent's submittal, in writing, of a reason acceptable to STC.

H. Validity Period

Proposals are to be valid for STC's acceptance for a minimum of 90 days from the submittal deadline date to allow time for evaluation, selection, and any unforeseen delays. Proposals, if accepted, shall remain valid for the life of the Contract.

2.3 Pricing and Delivery Schedule

A. Respondent must complete Pricing and Delivery Schedule, Section 4.

B. Pricing reflects the full Scope of Work defined herein; inclusive of all associated cost for delivery, labor, insurance, taxes, overhead, and profit, or as otherwise defined, as appropriate.

C. STC will not recognize or accept any charges or fees to perform this work that are not specifically stated in the Respondent's proposal.

2.4 Bonding

A. Respondent must submit a bid bond or certified check equal to 5% of the total price proposal amount. If a certified check is submitted in lieu of a bid bond, it will be made payable to South Texas College.

B. If the total contract price exceeds $25,000.00, the successful Respondent shall execute in accordance with the provisions of Chapter 2253, Texas Government Code, a Payment Bond in the amount equal to the total contract amount, solely for the protection of those supplying labor, materials and/or equipment in the prosecution of the subject contract. If the total contract price exceeds $100,000, the successful Respondent shall execute in accordance with the provisions of said Chapter 2253, Texas Government Code, a Performance Bond in the amount of the total contract price conditioned upon the faithful performance of the contract.

2.5 Submittal Checklist

Firms are instructed to return the following documents as a part of their proposal submittal. Failure to return these documents may subject your proposal to disqualification.

Signed and Completed Execution of Offer (Section 3)
Signed and Completed Pricing and Delivery Schedule (Section 4)
Signed and Completed Bid/Proposal Form (Section 5)
Responses to Respondent's Questionnaire (Section 6)
Signed and Completed Notification of Criminal History (Section 7)
Signed and completed Conflict of Interest Questionnaire (Section 8)
Bid Bond or cashier’s check for 5% of price proposal

SECTION 3
EXECUTION OF OFFER

THIS EXECUTION OF OFFER MUST BE COMPLETED, SIGNED, AND RETURNED WITH RESPONDENT'S PROPOSAL. FAILURE TO COMPLETE, SIGN AND RETURN THIS EXECUTION OF OFFER WITH THE PROPOSAL MAY RESULT IN REJECTION OF THE PROPOSAL.

1. By signature hereon, Respondent acknowledges and agrees that (1) this RFP is a solicitation for proposal and is *not* a contract or an offer to contract; (2) the submission of a proposal by Respondent in response to this RFP will *not* create a contract between STC and Respondent; (3) STC has made no representation or warranty, written or oral, that one or more contracts with STC will be awarded under this RFP; and (4) Proposer shall bear, as its sole risk and responsibility, any cost which arises from Respondent's preparation of a response to this RFP.

2. By signature hereon, Respondent offers and agrees to furnish to STC the products and/or services more particularly described in its proposal, at the prices quoted in the proposal, and to comply with all terms, conditions and requirements set forth in the RFP documents and contained herein.

3. By signature hereon, Respondent affirms that he has not given, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor or service to a public servant in connection with the submitted proposal.

4. By signature hereon, a corporate Respondent certifies that it is not currently delinquent in the payment of any Franchise Taxes due under Chapter 171, Texas Tax Code, or that the corporate Respondent is exempt from the payment of such taxes, or that the corporate Respondent is an out-of-state corporation that is not subject to the Texas Franchise Tax, whichever is applicable.

5. By signature hereon, the Respondent hereby certifies that neither the Respondent nor the firm, corporation, partnership or institution represented by the Respondent, or anyone acting for such firm, corporation, or institution has violated the antitrust laws of this state, codified in Section 15.01, et. seq., Texas Business and Commerce Code, or the Federal antitrust laws, nor communicated directly or indirectly the proposal made to any competitor or any other person engaged in such line of business.

6. By signature hereon, Respondent represents and warrants that:

    a. Respondent is a reputable company regularly engaged in providing products and/or services necessary to meet the terms, conditions and requirements of the RFP;

    b. Respondent has the necessary experience, knowledge, abilities, skills, and resources to satisfactorily perform the terms, conditions and requirements of the RFP;

    c. Respondent is aware of, is fully informed about, and is in full compliance with all applicable federal, state and local laws, rules, regulations and ordinances;

    d. Respondent understands (i) the requirements and specifications set forth in this RFP and (ii) the terms and conditions set forth in the Contract under which Respondent will be required to operate;

    e. All statements, information and representations prepared and submitted in response to this RFP are current, complete, true and accurate. Respondent acknowledges that STC will rely on such statements, information and representations in selecting the Successful Respondent. If selected by STC as the Successful Respondent, Respondent will notify STC immediately of any material change in any matters with regard to which Respondent has made a statement or representation or provided information.

7. By signature hereon, Respondent certifies that the individual signing this document and the documents made part of the RFP is authorized to sign such documents on behalf of the company and to bind the company under any agreements or other contractual arrangements, which may result from the submission of Respondent's proposal.

8. By signature hereon, Respondent certifies that no relationship, whether by relative, business associate, capital funding agreement or by any other such kinship exist between Respondent and an employee of STC, or Respondent has not been an employee of STC within the immediate twelve (12) months prior to your RFP response.

9. By signature hereon, Respondent certifies that neither the Respondent nor the firm is debarred, suspended or otherwise declared ineligible to contract by any federal, state or local public agency.

10. By signature hereon, Respondent agrees to defend, indemnify, and hold harmless South Texas College, all of its officers, agents and employees from and against all claims, actions, suits, demands, proceedings, costs, damages, and liabilities, arising out of, connected with, or resulting from any acts or omissions of Respondent or any agent, employee, subcontractor, or supplier of Respondent in the execution or performance of any agreements or other contractual arrangements which may result from the submission of Respondent's proposal.

11. By signature hereon, and pursuant to Chapter 2270 of the Texas Government Code, Respondent affirms that as condition for being considered for an award of a contract under this solicitation, it does not boycott the nation of Israel and that it will not boycott Israel during the term of any resultant contract.

12. By signature hereon, and pursuant to Chapter 2252 of the Texas Government Code, Respondent affirms that as a condition of being considered for an award of a contract under this solicitation, it is not engaged in business with Iran, Sudan or a foreign terrorist organization.

Please complete the following:

Respondent's FEI No: _____

If a Corporation: Respondent's State of Incorporation: _____

Respondent's Charter No: _____

Submitted and Certified By:

_____ _____
(Company/Respondent Name) (Authorized Signature)

_____ _____
(Date) (Printed Name/Title)

_____ _____
(Street Address) (Telephone Number)

_____ _____
(City, State, Zip Code) (Email Address)

SECTION 4
PRICING AND DELIVERY SCHEDULE

To: South Texas College

Ref.: RFP No.:19-20-1008

Ladies and Gentlemen:

Having carefully examined all the specifications and requirements of this RFP and any attachments thereto, the undersigned proposes to furnish the construction services as required pursuant to the aforementioned documents at the below quoted terms.

Base Proposal

Total Base Proposal Amount:

_____

($_____) Dollars.

Delivery Schedule: The undersigned agrees to begin work within _____ **working days** of a written "Notice to Proceed" and achieve substantial completion of the work within _____ **calendar days**.

Addenda Checklist

Receipt is hereby acknowledged of the following addenda to this RFP.

No. 1 _____ No. 2 _____ No. 3 _____ No. 4 _____

_____
Company Name

_____
(Signature)

_____
(Typed or Printed Name)

_____
(Position/Title)

SECTION 5
BID/PROPOSAL FORM
(Required of all Bidders/Proposers)

CERTIFICATE OF NON-INDEDTEDNESS

IN SIGNING THIS FORM AND SUBMITTING IT TO THE OWNER, THE BIDDER/PROPOSER CERTIFIES THAT IT IS NOT INDEBTED TO THE OWNER. THE OWNER MAY REFUSE TO ENTER INTO A CONTRACT OR OTHER TRANSACTION WITH A PERSON OR ENTITY INDEBTED TO THE OWNER

Form of Business Entity:

1. The Bidder/Proposer is a (check one)

   □ Sole Proprietorship owned by: _____

   □ Corporation organized and existing under the laws of the State of _____ whose officers are: _____, President; _____, Vice-President; and _____, Secretary

   (Bidder/Proposer must Include Articles of Corporation and Certificate of Good Standing)

   □ Partnership of: _____

   □ Other (describe): _____

2. If Bidder/Proposer is other than sole proprietorship, provide the following:

   Name of Person authorized to bind the entity _____

   Title: _____

3. Physical Address of Bidder/Proposer: _____

4. Mailing Address of Bidder/Proposer:_____

5. Bidder/Proposer's:
   Telephone Number: (___)_____ Fax No. (___)_____

6. Bidder's/Proposer's D/B/A (if any):

   (Include D/B/A registration certificate)

Current Projects: Attach a separate signed sheet describing the construction projects in which you are currently a subcontractor, or the Prime or General Contractor, describe the project, the Project Owner, and the dollar amount of the project.

Default History: Has Bidder/Proposer defaulted on a contract, or had a claim made against it on its Performance or Payment Bond by an owner or subcontractor within the last 10 years?

(*check one*): _____ Yes _____ No

Has Bidder/Proposer has sought bankruptcy protection within the last 10 years?

(*check one*): _____ Yes _____ No

Attach a separate signed sheet stating if you have ever defaulted on any construction contract or had a claim made against your Performance Bond or Payment Bond; or if you have declared bankruptcy during the last 10 years.

Bid/Proposal Security included in the amount of: $ _____

Form of Bid/Proposal Security: _____.

Respectfully submitted,

By: _____
Printed/
Typed Name: _____
Title: _____

(If Corporation affix corporate seal)

SECTION 6
RESPONDENT QUESTIONNAIRE

Respondents are requested to submit a complete response to each of the below listed items. Responses requiring additional space should be brief and submitted as an attachment to your proposal package. Please reference each response by its item number indicated below.

1. Criterion: The Respondent's price proposal
   a. Refer to Section 4, Pricing and Delivery Schedule.

2. Criterion: The Respondent's experience and reputation.
   a. Provide total number of current company employees: _____

   b. Provide dollar amounts for each project contracted in the past twenty-four months.

   c. Provide number of years your company has been in business: _____

   d. Are there currently or in the past five years, any judgments, claims, arbitration proceedings, claims on bonds or suits pending or outstanding against your organization or its officers?

   e. Provide a customer reference list of no less than five (5) organizations for whom your organization has previously provided services of equal type and scope within the past five (5) years as requested in this RFP. Reference list is to include company name, contact person, telephone number, email address and description of the project.

3. Criterion: The quality of the Respondent's goods or services
   a. Describe your company's quality control program.

   b. Explain the methods used to maintain quality control in the construction project.

   c. Describe the company's process for addressing warranty claims.

   d. Describe the experience of key personnel responsible for maintaining quality control.

   e. Provide examples of past STC construction projects or other similar projects (all respondents will receive a minimum of 3 points for item (e) unless it is determined that past performance is poor. References will be considered as part of the evaluation.

4. Criterion: The Respondent's safety record
   a. Provide a copy of your company's safety program or describe how job site safety is managed. Include safety policies which employees must be in compliance with.

   b. What is your company's Experience Modifier Rate (EMR) for the past three (3) most recent annual insurance year ratings?

   c. Have you had any OSHA fines within the last three (3) years? If yes, provide details.

5. Criterion: The Respondent's proposed personnel
   a. Provide resumes of the Respondent's team that will be directly involved in the project. The resume must include experience in similar projects, number of years with the firm and city of residence.

   b. Describe the project assignments and the percent of time each team member will be involved in the project.

c. Provide list of member(s) on your staff, directly involved in managing the project, who are Certified Construction Program Manager through the Construction Management Association of America (CMAA) or similar.

d. Within 24 hours after the proposal delivery date and time, provide a list of key subcontractors to be used, including a list of five projects recently completed by each subcontractor.

6. Criterion: The Respondent's financial capability in relation to the size and scope of the project
   a. Attach a letter of intent from a surety company indicating your company's ability to bond for the entire construction cost of the project and total bonding limitation.

   b. Is your company currently in default on any loan agreement or financing agreement with any bank, financial institution or other entity? If yes, provide details and prospects for resolution.

   c. Provide a list and description of all construction projects currently under contract, including total cost and start and end dates.

   d. Attach a Dunn and Bradstreet analysis or current financial statements, preferably audited.

7. Criterion: Respondent's organization and approach to the project
   a. Provide a statement of the project approach.

   b. Submit a work schedule with key dates and milestones.

   c. Do you anticipate difficulties in serving STC and how do you plan to manage these? What assistance will you require from STC?

8. Criterion: Respondent's time frame for completing the project
   a. Refer to Section 4, Pricing and Delivery Schedule

SECTION 7
NOTIFICATION OF CRIMINAL HISTORY

THIS FORM MUST BE COMPLETED, SIGNED, AND RETURNED WITH PROPOSAL

State of Texas legislative Bill No. 1 Section 4.034, Notification of Criminal History, Subsection (a) states
" a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony."

Subsection (b) states " a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract."

THIS NOTICE IS NOT REQUIRED OF A PUBLICLY-HELD CORPORATION

Please check off one box and sign the form in the appropriate space

I, the undersigned agent for the firm named below, certify; that the information concerning notification of felony convictions has been reviewed by me and the information furnished is true to the best of my knowledge.

VENDOR'S NAME:_____

AUTHORIZED COMPANY OFFICIAL'S NAME (PRINTED): _____

A. ☐ My firm is a publicly held corporation; therefore, this reporting requirement is not applicable.

SIGNATURE OF COMPANY OFFICIAL _____

B. ☐ My firm is not owned nor operated by anyone who has been convicted of a felony.

SIGNATURE OF COMPANY OFFICIAL _____

C. ☐ My firm is owned and/or operated by the following individual(s) who has/have been convicted of a felony:

Name of Person(s) convicted of felony _____

Details of Conviction(s) _____

_____

_____

_____

SIGNATURE OF COMPANY OFFICIAL _____

SECTION 8
CONFLICT OF INTEREST QUESTIONNAIRE

CONFLICT OF INTEREST QUESTIONNAIRE

FORM **CIQ**

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 1491, 80th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code by a person who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the person 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 person becomes aware of facts that require the statement to be filed. *See* Section 176.006, Local Government Code.

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

OFFICE USE ONLY

Date Received

1 **Name of person 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 the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Name of local government officer with whom filer has employment or business relationship.**

_____
Name of Officer

This section (item 3 including subparts A, B, C & D) must be completed for each officer with whom the filer has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the filer of the questionnaire?

☐ Yes ☐ No

B. Is the filer of the questionnaire receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

D. Describe each employment or business relationship with the local government officer named in this section.

4

_____ _____
Signature of person doing business with the governmental entity Date

Adopted 06/29/2007

☐ **This Form is Not Applicable.** _____

Authorized Signature

PROPOSAL INFORMATION

1. RECEIPT AND OPENING OF PROPOSALS

South Texas College (hereinafter called "Owner") invite proposals on the attached hereto; all blanks must be appropriately filled in. Proposals will be received by the Owner no later than date and time given below, and publicly opened and read aloud. The envelope containing the proposals must be sealed and addressed as shown on Section 2, Part 2.2, Item F – Submission.

The Owner may consider any proposal not prepared and submitted in accordance with the provisions hereof and may waive any formalities or reject any or all proposals. Any proposal withdrawn prior to the above scheduled time for the opening of proposals or authorized postponement thereof shall not be considered. Any proposals received after the time and date specified shall not be considered. No proposer may withdraw a proposal within 60 days after the actual date of the opening thereof.

2. SUBCONTRACTORS

The proposer is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract must be approved by the Owner.

3. INVESTIGATIONS

The Owner may make such investigations as he deems necessary to determine the ability of the proposer to perform the work, and the proposer shall furnish the Owner all such information and dates for this purpose as the Owner may request. The Owner reserves the right to reject any proposal if the evidence submitted by, or investigation of such proposer fails to satisfy the Owner that such proposer is properly qualified to carry out the obligations if the contract and to complete the work contemplated therein. Conditional proposals will not be accepted.
Owner in addition to the proposal requirements and specifications will use “Selection Criteria” on Item 1.9 of the Notice to Respondents (Section 1) to evaluate the proposers.

4. LIQUIDATED DAMAGES FAILURE TO ENTER INTO CONTRACT

The successful proposer, upon his failure or refusal to execute and deliver the contract and bonds required within 10 days after he has received notice of the acceptance of his proposal, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his proposal.

5. LIQUIDATED DAMAGES

Proposer must agree to commence work on or before a date to be specified in written "Notice to Proceed" by the Owner, and to fully complete the project within the time stated on proposal. As failure to complete project within the stated time, proposer agrees to pay as liquidated damages, the sum of (as listed below) for each consecutive calendar day of delay until work is completed and accepted.
Refer to Article 8.3.1 Liquidated Damages in the Supplemental General Conditions of the Contract for Construction AIA Document A201-2007 for amounts.

Delays because of strikes, fire, weather, or any cause beyond the contractors control shall be

granted, but claims for extension shall be in writing within a reasonable time after the occurrence.

Contractor shall submit request for delay on a monthly basis in a letter form indicating reason and date of delay. Failure to do so on a monthly basis means contractor will forfeit those delay days.

6. TIME OF COMPLETION:

Proposer must agree to commence work on or before a date to be specified in written "Notice to Proceed" by Owner and to fully complete the project within the time stated on the proposal.

7. CONDITIONS OF WORK

Each proposer must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful proposer of his obligations to furnish all materials and labor necessary to carry out the provisions of this contract. Insofar as possible the Contractor, in carrying out the work, must employ such methods or means as will not cause any interruption or interference with the work of any other Contractor.

8. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the plans, specifications or other pre-proposal documents will be made to any proposer orally.
Every request for such interpretation should be in writing addressed to EGV Architects, Inc., 220 S. Bridge, Hidalgo, TX 78557, and to be given considerations must be received at least five days prior to the date fixed for the opening of proposals. Any and all such interpretations and any supplemental instructions will be mailed to the respective address furnished for such purpose. Failure of any proposer to receive any such addendum or interpretations shall not relieve such proposer from any obligations under his proposal as submitted. All addenda so issued, shall become part of the contract documents.

9. PERFORMANCE/ PAYMENT BOND

Simultaneously with his delivery of the executed contract, the Contractor shall furnish a Performance and Payment Bond for the faithful performance of this contract and for the payment of all persons performing labor on the project as specified in the General Conditions and as described in the Invitation for Competitive Sealed Proposals. The surety company shall be licensed in the state of Texas, & A. M. Best rated.

10. POWER OF ATTORNEY

Attorney-in-fact who signs security bond or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

11. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

a) Inspections and testing of materials
b) Insurance requirements (Refer to Supplemental General Conditions of the Contract

for Construction AIA Document)

12. LAWS AND REGULATIONS

The Proposer's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

13. METHOD OF AWARD:

The Owner reserves the right to select the most advantageous proposal. The project proposals shall be determined by combining the base proposal and any alternate selected by the Owner (additive and deductive). If there are several areas of work, the Owner reserves the right to select one or more Contractors for each area of work.

14. OBLIGATION OF BIDDER:

At the time of the opening of proposals, each proposer will be presumed to have inspected the site and to have read and be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any proposer to examine any form instrument or document shall in no way relieve any proposer from any obligation with respect if his proposal.

15. CONTRACT AGREEMENT FORM

The Agreement for the project will be the Standard Form of Agreement between STC and the Contractor, AIA Documents A101-2017 and A201-2007, as modified. Copies of the AIA Contract Documents are attached hereto.

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year «Two Thousand Nineteen »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«South Texas College»«»
«3201 W. Pecan Ave.
McAllen, TX 78501»
«Telephone Number: 956-872-3737»
«Fax Number: 956-872-3747»

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«South Texas College Pecan Campus Building H Renovation»
«3201 W. Pecan Ave.
McAllen, TX 78501»

«Culinary Arts Renovation»

The Architect:
(Name, legal status, address and other information)

«EGV Architects, Inc.»«, General Corporation»
«P O Box 8627
Hidalgo, TX 78557»
«Telephone Number: 956-843-2987»
«Fax Number: 956-843-9726»

The Owner and Contractor agree as follows.

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

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« X »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« X »] By the following date: «As stated in the "Notice to Proceed" »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
N/A	

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
N/A	N/A

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
N/A	N/A	N/A

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
N/A	N/A

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)
N/A	N/A	N/A

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

«See attached "Supplemental General Conditions of the Contract for Construction AIA Document A201-2007" »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

«n/a »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« See attached "Supplemental General Conditions of the Contract for Construction AIA Document A201-2007" »

~~**§ 5.1.3** Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.~~
~~*(Federal, state or local laws may require payment within a certain period of time.)*~~

~~**§ 5.1.4** Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.~~

~~**§ 5.1.5** Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.~~

§ 5.1.6 In accordance with AIA Document A201™–2007, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2007;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2007; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

«Five Percent (5%) »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

«N/A »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

«N/A »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

«N/A »

~~**§ 5.1.8** If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.~~

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« See attached "Supplemental General Conditions of the Contract for Construction AIA Document A201-2007" »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

«None » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[«X»] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

«N/A »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

«Ricardo de la Garza»
«Director of Planning and Construction»
«3200 W. Pecan Ave.»
«McAllen, TX 78501»
«Tel: 956-872-3737»
«Email: rickdlg@southtexascollege.edu»

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The ~~Owner and the~~ Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2007, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

«N/A »

§ 8.7 Other provisions:

«None »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2007, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date
Refer to Exhibit "B"	Index of Drawings	

.6 Specifications

Section	Title	Date	Pages
Refer to Exhibit "C"	Specifications Table of Contents		

.7 Addenda, if any:

Number	Date	Pages
Addendum #1		

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« X »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
See attached "Supplemental General Conditions of the Contract for Construction AIA Document A201-2007"	Exhibit "D"	4/6/10	14

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2007 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

«Perfomance Bond
Payment Bond
Power of Attorney
Certificate of Insurance
Notice to Proceed »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«Dr. Shirley A. Reed»«, President»	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
«South Texas College Pecan Campus Building H Renovation»
«3201 W. Pecan Ave.
McAllen, TX 78501»

THE OWNER:
(Name, legal status and address)
«South Texas College»«»
«3201 W. Pecan Ave.
McAllen, TX 78501»

THE ARCHITECT:
(Name, legal status and address)
«EGV Architects, Inc.»«, General Corporation»
«P O Box 8627
Hidalgo, TX 78557»

TABLE OF ARTICLES

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

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

DRAFT

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

INDEX
(Topics and numbers in bold are section headings.)

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 (General, Supplementary and other Conditions), 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 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. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 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 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 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 indicated results.

§ 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.

§ 1.3 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 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS 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. 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 endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner 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 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. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, 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. 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 pursuant to Section 1.5.2.

§ 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, except to the extent required by Section 6.1.3.

§ 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.

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.

§ 3.1.2 The Contractor shall perform the Work in 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.

§ 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 Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. 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.

§ 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 Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 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. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 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.

§ 3.4 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.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the 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.

§ 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.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants 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. Work, materials, or equipment not conforming to these requirements may be considered defective. 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 Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 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.

§ 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 Architect will promptly investigate such conditions and, if the Architect 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 recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect 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 Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed 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 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.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 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 shall be as binding as if given to the Contractor.

§ 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 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 Architect requires additional time to review. Failure of the 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, promptly after being awarded the Contract, 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.

§ 3.11 DOCUMENTS AND SAMPLES 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. 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 Contractor shall provide the Owner and Architect 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 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce

other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. 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 FACILITATING 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 communicate with each other through the Architect about matters arising out of or relating to the Contract. 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 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 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 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 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 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 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 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 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 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. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 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.

§ 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 AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall 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 or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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 and Architect. 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.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall 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.

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 Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. 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.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 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 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 or 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 the Architect will 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 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.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and 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.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and 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 Architect 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 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 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 Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect 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

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. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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. 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 determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

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 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 Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the 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 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.

§ 9.3.2 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, 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.

§ 9.4 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 Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The 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 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 unless security acceptable to the Owner is provided by the Contractor;
- **.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** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** 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.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven 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 Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 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.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 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.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 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.

§ 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 Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such 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 list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor

shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect 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. 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 applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 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 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. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such 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 Unless otherwise agreed upon, 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 Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly 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.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (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, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a

bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, 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 special warranties required by the Contract Documents.

§ 9.10.5 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.

§ 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.

§ 10.3 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. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 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 required by the Contract Documents. The Owner shall be responsible for materials or substances 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 and 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.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 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 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; 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 Contract Documents or required by law, whichever coverage is greater. 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 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants 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, the Owner 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.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 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.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final

payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 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 covered by 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 held by the Owner as fiduciary. 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.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. 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.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

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 Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the 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 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the 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 unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. 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 correct it in accordance with Section 2.4.

§ 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.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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 the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 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 Section 13.2.2, 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.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 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 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, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) 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 Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 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.

§ 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 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

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 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 requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

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 30 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;
- **.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 a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 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 seven 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.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven 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.

§ 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 incurred by the Owner 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. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 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 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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 by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 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 decisions of the Initial Decision Maker.

§ 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.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

SUPPLEMENTAL GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A201 - 2007

OWNER: South Texas College

CONTRACTOR: _____

PROJECT: _____

The following amendments to the indicated Articles in AIA Document A201 - 2007 General Conditions of the Contract for Construction shall be incorporated into and be made a part of the Agreement Between Owner and Contractor:

ARTICLE 2 – OWNER

1. In §2.3, line 3, after "Contractor" **add** "and the Contractor's surety"**. In line 5, after** "not give rise to a" **add** "breach of contract claim by the Contractor or to a"

2. Delete text of §2.4 and replace with: If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, the Owner may make a written request to the Contractor and Contractor's surety to commence and continue correction of such default or neglect with diligence and promptness, subject to Owner's right to carry out the work. If the Contractor or the Contractor's surety fails, within a ten-day period after receipt of the 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 rights and remedies the Owner may have, correct such deficiencies in accordance with the Contract Documents. In such case an appropriate Change Order shall be issued deducting from the Contract Sum 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. If the balance of the Contract sum is not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. The notice required under this section may notify the Contractor and the Contractor's surety that the Owner may also exercise its rights under §14.2.2 without further notice to the Contractor and the Contractor's surety.

ARTICLE 3 – CONTRACTOR

1. Add the following text to end of §3.1.2: The Contractor and Owner agree that time is of the essence in completion of the Work.

2. In §3.2.2, line 7 after "shall promptly report" **add** "in writing". **In line 8, delete** "as a request for information in such form as the Architect may require".

3. **In §3.2.3, line 3, after** "shall promptly report" **add** "in writing". **In line 4, delete** "as a request for information in such form as the Architect may require".

4. **Add new: §3.3.4** The Contractor shall arrange for the furnishing of and/or shall pay the costs of all utility services, including, without limitation, electricity, water, gas and telephone necessary for performance of the Work and the Contractor's obligations under the Contract Documents, until occupancy by the Owner or Substantial Completion, whichever occurs first.

5. **At the end of §3.5, add** The Contractor warrants the merchantability, the fitness for use, and the quality of all substitute or alternative items in addition to any warranty given by the manufacturer or supplier of such item. **Make this §3.5.1**.

6. **Add new: §3.5.2 Warranty Work.** If, within one year after the date of Substantial Completion, any of the Work is found to be defective or not in accordance with the requirements of the Contract Documents, or otherwise contrary to the warranties contained in the Contract Documents, the Contractor shall commence all necessary corrective action not more than seven (7) days after receipt of a written notice from the Owner to do so, and to thereafter diligently complete the same. In the event that Contractor shall fail or refuse to commence correction of any such item within said seven (7) day period or to diligently prosecute such corrective actions to completion, the Owner may, without further notice to Contractor, cause such corrective Work to be performed and completed. In such event, Contractor and Contractor's Performance Bond Surety shall be responsible for all costs in connection with such corrective Work, including without limitation, general administrative overhead costs of the Owner in securing and overseeing such corrective Work. Nothing contained herein shall be construed to establish a period of limitation with respect to any obligation of the Contractor under the Contract Documents. The obligations of the Contractor hereunder shall be in addition to, and not in lieu of, any other obligations imposed by any special guarantee or warranty required by the Contract Documents, guarantees or warranties provided by any manufacturer of any item or equipment forming a part of, or incorporated into the Work, or otherwise recognized, prescribed or imposed by law. Neither the Owner's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by Owner shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein.

7. **Add new: §3.5.3 Survival of Warranties.** The provisions of this Article 3.5 shall survive the Contractor's completion of Work under the Contract Documents, the Owner's Final Acceptance or the termination of the Contract due to Contractor's fault.

8. **Add new: §3.8.4** The Contractor shall include all allowances stated in the Contract Documents as a schedule of values categorized item for which the allowance

is specified. Upon completion of the Work, any remaining balance will belong to the Owner.

9. Delete text of §3.18.1, and replace with: The Contractor shall indemnify, defend and hold harmless the Owner and its Board of Trustees, officers, employees, agents and representatives from and against any and all claims, demands or liability for damages, or other relief for (i) injuries to or death of persons; (ii) damage to property; or (iii) theft or loss of property resulting, in whole or in part, from any acts, omissions or other conduct of Contractor, any of Contractor's Subcontractors, of any tier, or any other person or entity employed directly or indirectly by Contractor in connection with the Work and their respective agents, officers or employees, including, without limitation, attorneys fees and costs incurred or arising therefrom. In the event that Contractor's insurers fail to tender a defense for Owner in any action or proceeding, whether judicial, administrative, or otherwise, commenced on account of any claim, demand or liability subject to Contractor's obligations hereunder, and such action or proceeding names the Owner as a party thereto, the Contractor shall, at its sole cost and expense, defend the Owner in such action or proceeding with counsel reasonably satisfactory to Owner. In the event that there shall be any judgment, award, ruling, settlement, or other relief arising out of any such action or proceeding to which the Owner is bound by and which Contractor's insurers refuse to pay, Contractor shall pay, satisfy or otherwise discharge any such judgment, award, ruling, settlement or relief, and Contractor shall indemnify and hold harmless the Owner from any and all liability or responsibility arising out of any such judgment, award, ruling, settlement or relief. The Contractor's obligations hereunder shall survive notwithstanding Contractor's completion of the Work or the termination of the Contract. To fulfill this condition, the Contractor shall purchase the appropriate Contractor's Liability Insurance, and name Owner as an additional insured in all liability insurance policies required of Contractor under the contract for construction.

ARTICLE 7 – CHANGES IN THE WORK

1. In §7.1.1, line 2, delete: "Construction Change Directive or order for a minor change in the Work"

2. In §7.1.2, delete, "; 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 Architect alone"

3. In §7.1.3, delete, ", Construction Change Directive or order for a minor change in the Work"

4. Add new: §7.2.2 If changes in plans or specifications are necessary after the performance of the contract is begun or if it is necessary to decrease or increase the quantity of work to be performed or of materials, equipment, or supplies to be furnished,

the Owner's Board of Trustees or authorized representative may approve change orders prior to making the changes. The total contract price may not be increased because of the changes unless additional money for increased costs is appropriated for that purpose from available funds or is provided for by the authorization of the issuance of time warrants. The original contract price may not be increased by more than 25 percent. The original contract price may not be decreased by more than 25 percent without the consent of the contractor. All proposed change orders shall be submitted to the Owner for review and approval. Change orders that increase the contract price shall require a commensurate increase in the performance and payment bonds.

5. Delete §§7.3, 7.3.1, 7.3.2, 7.3.3, 7.3.4, 7.3.5, 7.3.6, 7.3.7, 7.3.8, 7.3.9, 7.3.10

6. Delete §7.4

ARTICLE 8 - TIME

1. Add new: §8.2.4 Within ten (10) days following notice to proceed from the Architect, the Contractor shall prepare and submit to the Architect a Preliminary Progress Schedule, in CPM format, indicating, the estimated rate of progress and sequence of all Work required under the Contract Documents. The purpose of the Preliminary Progress Schedule is to assure adequate planning and execution of the Work so that it is completed within the Contract Time and to permit evaluation of the progress of the Work. The Preliminary Progress Schedule shall indicate the dates for commencement and completion of various portions of the Work, including, without limitation, the submittal, approval, procurement and fabrication of major items, material and equipment forming a part of, or to be incorporated into, the Work as well as site construction activities. The Contractor shall meet with the Architect, at least, on a monthly basis to review and revise and update the Progress Schedule.

2. Delete text of §8.3.1 and replace with: §8.3.1 Liquidated Damages. Time is of the essence in the performance by Contractor under this agreement. In the event that the Contractor shall fail to achieve substantial completion of the work on the project by the Substantial Completion Date, as this date may be equitably adjusted for excusable delay under §8.3.3 and §8.3.6, the Contractor shall be liable to pay the Owner liquidated damages in the amount of $ 500.00 per day for each day that the Substantial Completion Date exceeds the date stated in the Contract for Construction. The Contractor authorizes the Owner to deduct such liquidated damages amount from any monies due to the Contractor under this Agreement, if any. The Owner shall have the right to recover any unpaid liquidated damages from the Contractor.

3. Delete text in §8.3.2, add replace with: Excusable Delay. Claims relating to time shall be made in accordance with applicable provisions of Article 15. In the event that the Contractor is delayed in achieving Substantial Completion of the work, the Contractor shall be entitled to an equitable extension of time of the Substantial Completion Date for any excusable delay. For this purpose, excusable delay means

delay in actually achieving Substantial Completion occasioned by unforeseeable unavoidable casualties or other unforeseeable causes beyond the reasonable control and without any fault or neglect of the Contractor or its Subcontractors or Material Suppliers, including, without limitation, unanticipated and unavoidable labor disputes, unusual and unanticipated delays in transportation of materials, equipment or construction equipment reasonably necessary for the proper execution of the Work, delay caused by Owner's acts or omissions, and adverse weather conditions.

4. Delete text of §8.3.3, and replace with: §8.3.3 No Damages for Delay. The Contractor's sole remedy for any excusable delay shall be an equitable adjustment of time to extend the Final Completion Date. In the event the Contractor seeks to recover damages for any Owner-caused delay, notwithstanding this §8.3.3:

.1 the Contractor shall be deemed to have waived its right to request an equitable extension of time under §8.3.2 for this delay claim whether or not Contractor recovers any damages;

.2 the Contractor shall be limited to recover only actual direct economic damages against the Owner should the Contractor prevail in its delay damages claim.

.3 the Contractor shall not recover its attorney's fees in any legal proceeding if, at mediation or thereafter, the Contractor refuses the Owner's final offer of settlement on Contractor's claim for equitable extension of time under §8.3.2 or for Owner-caused delay damages under §8.3.3 unless the Contractor recovers an amount of time extension or money damages, if any, that exceeds the Owner's final settlement offer by twenty percent (20%), and the Owner shall be entitled to offset its attorney's fees from the amount, if any, awarded to Contractor.

5. Add new: §8.3.4 No Pass-Through Claims. Nothing herein shall be construed to allow or permit the Contractor to assert against the Owner any pass-through claims of its lower tier subcontractors or suppliers unless the Contractor has been adjudged liable for any such claims, by final judgment of a court of law of competent jurisdiction.

6. Add new: §8.3.5: Notice of Delay Claims. The Contractor shall be required to provide written notice to the Owner of any event or series of events which the Contractor considers a delay-causing event(s) within ten (10) calendar days after the occurrence of the event. Any claim not timely presented, as stated in this section, shall be deemed waived. In its written notice of claim, the Contractor is required to:

.1 document in detail, any claim for delay through the use of Critical Path Method (CPM) schedules and establish a causal link between the event and the delay. In establishing this causal link, the Contractor must show that the alleged

delay-causing event affected activities on the critical path of the Contractor's performance of the contract;

.2 fully explain why the delay should be considered excusable delay under §8.3.2 and state whether the Contractor will be requesting an equitable extension of time on the Completion Date or seeking damages for Owner-caused delay; and

.3 if the Contractor intends to seek recovery of damages for the Owner-caused delay, explain in detail why the Contractor contends that it is entitled to damages and fully document the actual direct damages the Contractor anticipates it will sustain.

Owner may reasonably request additional information on any delay claim that will assist and facilitate its determination of the claim under §8.3.6. The Contractor shall expeditiously provide the requested information. The Contractor may supplement any claim timely made with additional information in support of the claim. The Owner may, at anytime, after receiving a notice of claim hereunder provide a written response to the Contractor stating its agreement or disagreement with the Contractor's claim.

7. Add new: §8.3.6 Determination of Delay Claims. The Owner shall maintain a record of all notices timely submitted under §8.3.5. Upon certification by the Architect that the work has been finally completed, if the Contractor failed to complete the work by the Final Completion Date stated on the Contract for Construction and has timely submitted notice of delay claims under §8.3.5, the Owner, shall, prior to making final payment of any retainage or amount owed Contractor on the Contract Sum, submit all the notices of delay claims and Owner responses, if any, to the Initial Decision Maker for decision whether or not the Contractor is entitled to an equitable extension of time on the Final Completion Date under provisions of §8.3.2 or is entitled to the limited delay damages under §8.3.3, and/or whether the Owner is entitled to any liquidated damages under §8.3.1. The Initial Decision Maker shall render his decision within fifteen (15) days, subject to the following:

.1 A claim for an equitable extension of time or for damages for Owner-caused delay that is waived due to untimeliness or other reason shall not be the subject of set-off or counterclaim.

.2 In the event, that the Contractor has not provided the Owner additional documentation of delay damages reasonably requested by the Owner under §8.3.5, the 15-day period for decision commences when the requested additional documentation is received by the Owner.

.3 If the Owner and Contractor disagree with the decision of the Initial Decision Maker, and fail to resolve the Contractor's claim for equitable extension of the Final Completion Date based on excusable delay or claim for delay

damages and the Owner's entitlement to liquidated damages, either party may, at anytime, thereafter, request mediation of the claim under §15.3.

ARTICLE 9 – PAYMENTS AND COMPLETION

1. Delete text of §9.2, and replace with: Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values which allocates the entire Contract Sum to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect and Owner may require. The Contractor shall on timely basis submit a revised schedule of values to the Architect, as needed to reflect changes in the contract sum and changes in the scope of work. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

2. In §9.3.1, line 1, delete the following text: "At least ten days before the date established for each progress payment" **and replace with the following: "**Notwithstanding any other provision, Contractor shall submit applications for payment to the Architect not later than the twenty-fifth (25th) day of each month. If the application for payment is mailed, to be timely, actual delivery of the application to the Architect must occur within three days of the postmark date. An application for payment received by the Architect after the twenty-fifth (25th) day of any month shall be deemed to have been timely received on the month following the month of actual receipt. The Contractor bears the risk of timely and accurate delivery of the application for payment."

3. Delete text of §9.3.1.1, and replace with: Such applications may include requests for payment on account of changes in the Work that have been properly authorized by Change Orders.

4. In §9.5.1, add the following text at the end of numeration .3: "if the Contractor has failed to provide a Payment Bond under Chapter 2253 of the Government Code;"

5. Delete §9.5.3

6. Delete text of §9.6.1, and replace it with: The Owner shall make payment not later than the 30th day after the Owner receives the Contractor's application for payment. Provided, however, that the Owner shall not have to make payment of a disputed amount within the time period stated in this sub-section if:

(1) there is a bona fide dispute between the Owner and Contractor, subcontractor, or supplier about the goods delivered or the service performed that causes the payment to be late;

(2) there is a bona fide dispute between a vendor and a subcontractor or between a subcontractor and its supplier about the goods delivered or the service performed that causes the payment to be late;

(3) the terms of a federal contract, grant, regulation, or statute prevent the governmental entity from making a timely payment with federal funds; or

(4) the application for payment is not delivered to the Architect

7. Delete §§ 9.6.7 and 9.7

8. Delete text of §9.10.1, and replace with: 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 Architect will promptly make such inspection and determine if the Work is acceptable under the Contract Documents. If the Architect finds the Work acceptable under the Contract Documents, the Architect will inquire of the Initial Decision Maker if there is any delay claim pending determination under §8.3.6. If a delay-claim is pending determination, the Architect shall withhold issuing a final Certificate for Payment until the Owner notifies the Architect that the delay claim has been resolved. If no delay claim is pending determination at the time the Contractor submits a final Application for Payment, and the Contract fully performed on or before the Final Completion Date stated in the Contract for Construction , the Architect will promptly 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.

9. Delete §9.10.3

10. In §9.10.4, numeration .2, delete "or"

11. In §9.10.4, numeration .3, add "or" **and add the following text:**
".4 liquidated damages or Contractor-caused delay"

12. In § 9.10.5, line 2 after "previously", **add the text** "timely"

ARTICLE 11 – INSURANCE AND BONDS

1. Delete text of §11.1.1, and replace with: As part of the Contractor's obligations and responsibilities under the Contract Documents, the Contractor, for the protection and benefit of the Owner and any and all of its agents and employees, the Contractor shall specifically procure, pay for, and maintain, in full force and effect the following policies of insurance to be written by an insurer who is authorized to do business in the

State of Texas and which shall, at a minimum, afford the following types and limits of coverage:

(1) Commercial General Liability ("CGL") insurance written on an occurrence basis which, at a minimum, includes the following types of coverage:

a) premises/operations liability;
b) products and completed operations liability;
c) contractual liability;
d) explosion, collapse and underground hazard liability and personal injury liability; and
e) personal injury liability

Minimum coverage under the above shall be in the following limits of liability:

General Aggregate:	$2,000,000.00
Products & Completed Operations Aggregate:	$2,000,000.00
Personal & Advertising Injury	$1,000,000.00
Each Occurrence	$1,000,000.00
Fire Damage (any one fire) Fire Damage (any one fire) - Medical Expenses	$1,000,000.00

Completed Operations and Products Coverage, with a specific endorsement naming the Owner as additional insured, shall be maintained in full force and effect for two years following the date of final payment, and shall be a condition precedent to the Contractor asserting any right under this agreement.

The CGL Policy shall be written to include the Owner as an additional insured

(2) Worker's Compensation Insurance and Employer's Liability with the following limits:

Worker's Compensation	-	Statutory
Employer's Liability	-	$1,000,000.00 each occurrence $1,000,000.00 disease – policy limits $1,000,000.00 disease – policy limits

The policy shall provide a waiver of subrogation against the Owner.

(3) Business Automobile policy to cover owned, non-owned, and hired vehicles for a limit of $1,000,000.00 combined single limit.

The Contractor's liability insurance required herein shall be primary. The Contractor shall maintain this coverage in full force and effect until the Work is completed and the Owner has made final payment. If the Contractor fails to purchase and maintain any

liability insurance required herein, the Owner, without waiving any right, may, without obligation to do so, upon five days' written notice to the Contractor, purchase such insurance on behalf of the Contractor. The Owner shall be entitled to be reimbursed by the Contractor promptly or at its option deduct the amount of such premiums from the unpaid balance of the contract amount, and the Contractor shall be responsible for reimbursing the Owner for any portion of the premium not covered by the unpaid Contract Sum.

2. Delete text of §11.1.3, and replace with: Prior to commencement of the Work, Contractor shall deliver to the Owner copies of Insurance policies evidencing the insurance coverages required by §11.1. Failure or refusal of the Contractor to so deliver Certificates of Insurance may be deemed by the Owner to be a default of a material obligation of the Contractor under the Contract Documents and, thereupon, the Owner may proceed to exercise any right or remedy provided for under the Contract Documents or at law. The insurance policies required by §11.1 shall contain a provision that coverages afforded under such policies will not be canceled, allowed to expire without renewal, or materially changed, except where necessary to increase coverage for the Owner's protection, until at least thirty (30) days prior written notice has been given to the Owner by the insurer. The Contractor shall, from time to time, furnish the Owner, when requested, with satisfactory proof of coverage of each type of insurance required by the Contract Documents; failure of the Contractor to comply with the Owner's request may be deemed by the Owner to be a default of a material obligation of the Contractor under the Contract Documents. An additional policy endorsement evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

3. In §11.1.4, line 2, after "Consultants" **add the following text** ", and the Contractor's sub-contractors". **Add the following text at the end of this section:** "Such additional insured status shall be evidenced by proper endorsement to the policy and subsequent renewals."

4. In §11.3.1, line 1, replace "Owner" **with** "Contractor".

5. Delete text of §11.3.1.2 and replace with: If the Owner decides to purchase such "all-risk" property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Owner shall, within ten (10) days of such notification provide the Contractor a copy of the insurance policy providing such coverage. The Contractor shall, then, by appropriate Change Order credit to the Owner the cost of the premium which the Contractor charged to the Owner under the Contract. If the Owner fails to provide proof of this insurance coverage within the period stated,

the Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner.

6. Delete §§ 11.3.7, 11.3.8, 11.3.9, 11.3.10 and 11.4.1

7. Delete text of §11.4.2, and replace with: Prior to commencement of the Work, the Contractor shall furnish a Performance Bond as security for Contractor's faithful performance of the Contract and a Labor and Material Payment Bond as security for payment of persons or entities performing work, labor or furnishing materials in connection with Contractor's performance of the Work under the Contract Documents. The amounts of the Performance Bond and the Payment Bond required hereunder shall be one hundred percent (100%) of the Contract Price. Said Labor and Material Payment Bond and Performance Bond shall be in the form and content set forth in the Contract Documents. The failure or refusal of the Contractor to furnish either the Performance Bond or the Labor and Material Payment Bond in strict conformity with this section may be deemed by the Owner as a default by the Contractor of a material obligation hereunder. Upon request of the Contractor, the Owner may consider and accept, but is not obligated to do so, multiple sureties on such bonds. The Surety on any bond required under the Contract Documents shall be on the list of sureties approved by the United States Department of Treasury, as set forth in the Federal Register and shall be authorized to do business in the state of Texas. The payment bond shall be solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or a subcontractor to supply public work labor or material. A payment bond required by this section must be executed by a corporate surety in accordance with Section 1, Chapter 87, Acts of the 56th Legislature, Regular Session, 1959 (Article 7.19-1, Texas Insurance Code).

The Performance Bond and the Payment Bonds required herein must clearly and prominently display on the bond or on an attachment to the bond 1) the name, mailing address, physical address, and telephone number, including the area code, of the surety company to which any notice of claim should be sent; or 2) the toll-free telephone number maintained by the Texas Department of Insurance under Article 1.35D, Insurance Code, and a statement that the address of the surety company to which any notice of claim should be sent may be obtained from the Texas Department of Insurance by calling the toll-free telephone number.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

1. Delete text of §13.1.1, and replace with: The Contract shall be governed by the law of the State of Texas.

2. Add new: §13.2.3 If the Contractor assigns or pledges the proceeds of this contract to secure any debt of the Contractor, such assignment or pledge shall not be

binding upon the Owner unless the Owner, for valuable consideration, agrees to become bound to directly pay monies earned by the Contractor under this contract to the Contractor's creditor(s), and which agreement shall be required to be reflected in the minutes of a duly called meeting of the Owner's board of trustees. However, in no event shall any such agreement operate to abrogate a Surety's statutory right to claim and receive monies earned by the Contractor under this contract.

3. Delete text of §13.6, and replace with: Payments due and unpaid under the Contract Documents shall accrue interest from the date that the payment becomes overdue, in accordance with §2251.025 of the Texas Government Code (Prompt Payment Act), as amended.

4. At the end of §13.7, delete the following text: ", but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7." **and replace it with the following:** "of limitations and statute of repose, subject to such claims being waived, as provided by law."

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

1. Delete §§14.1, 14.1.1, 14.1.2, 14.1.3 and 14.1.4.

2. In §14.2.1, delete the first sentence and replace it with: "After providing written notice, as required under §2.4, the Owner may terminate the Contract and demand that the Contractor's surety take over the Work, if the Contractor"

3. In § 14.2.2, delete the first sentence and replace it with: "When any of the above reasons exist, and the Contractor's surety fails or refused to take over completion of the Work within ten (10) days after receiving such demand from the Owner, the Owner may terminate employment of the Contractor and may, subject to any prior rights of the surety:"

4. In §14.2.4, line 4, after "Contractor", add the following text: "or the Contractor's surety,"

5. Delete §§14.3, 14.3.1, 14.3.2, 14.4, 14.4.1, 14.4.2 and 14.4.3.

ARTICLE 15 CLAIMS AND DISPUTES

1. In §15.1.2, line 3, before, "Claims by either party", add the following text: "Except for notice of delay claims under §8.3.5,"

2. Delete text of §15.1.5.1, and replace with: "If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided in §8.3.5 shall be given. In the case of a continuing delay, only one Claim is necessary."

3. Delete §§15.1.5.2 and 15.1.6.

4. In §15.2.2, line 1, after "Claims", add the following text: "except for delay claims made under §8.3.5,"

5. In§ 15.2.3, line 1, after "Claims", add the following: "except delay claims under §8.3.6,"

6. In §15.2.4, line 2, after "supporting data", add the following text: "under §15.2.3"

7. In §15.2.5, line 4, after "Maker", delete: ", of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution" **and add** "."

8. In §15.2.6 delete the following text: "subject to the terms of Section 15.2.6.1"

9. Delete §15.2.6.1.

10. In §15.2.7, line 1 and line 3, delete the following text: "but is not obligated to,"

11. Delete §15.2.8.

12. Delete text of §15.3.1, and replace with: Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to the filing of any lawsuit. Unless the parties mutually agree otherwise, mediation shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect.

13. Delete text of §15.3.2, and replace with: A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation.

14. In §15.3.3, add the following text to the end: ", and may only be set aside on the basis of fraud or illegality by the other party."

15. Delete §§15.4, 15.4.1, 15.4.1.1, 15.4.2, 15.4.3, 15.4.4, 15.4.4.1, 15.4.4.2, 15.4.4.3

OWNER: **CONTRACTOR:**

_____ _____

By *(Signature)*

_____
(Printed/Typed Name)

_____
Title

By *(Signature)*

_____
(Printed/Typed Name)

_____
Title

DIVISION 1 GENERAL REQUIREMENTS
01 10 00 SUMMARY OF WORK

PART 1 GENERAL:

1.1 PROJECT:

NAME:	PECAN CAMPUS BUILDING “H” RENOVATION FOR CULINARY ARTS RFP NO. 19-20-1008
LOCATION:	REFER TO DRAWING SHEET G1.1
OWNER:	SOUTH TEXAS COLLEGE
ARCHITECT:	EGV ARCHITECTS, INC.

1.2. SCOPE:

A. It is the intent and purpose of these specifications and the accompanying Drawings for the Contractor to provide all work, supervision, labor, materials, transportation and any other services necessary to perform the General Construction for this project, complete in every detail, within the limits shown. The general construction of this project shall be complete in every detail and respect, any omissions in these specifications and accompanying Drawings not withstanding. Any reference, hereinafter, to the word "Contractor" shall refer to the General Contractor.

B. The Project consists of providing ALL MATERIAL AND LABOR as shown on CONTRACT DOCUMENTS prepared by the Architect.

C. The Owner will occupy the site and existing building during construction. Cooperate with the Owner to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

D. A Certificate of Substantial Completion will be executed for each portion of the Work occupied prior to Owner occupancy.

E. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

F. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

G. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

H. In all circumstances keep driveways clear at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize requirements for storage of materials.

1.3. GENERAL CONTRACTOR'S RESPONSIBILITY

A. It is the General Contractor's responsibility prior to the beginning of construction, to

acquaint each subcontractor, superintendent of construction, foremen, workmen, service organization, or any one else who is or will be responsible either wholly or partially, for the execution of any section or trade under this contract with all provisions of the General Conditions and all other requirements of the plans and specifications which are applicable or may become applicable to his or their part of the work. The contractor is fully obligated to the Owner for all work performed by all subcontractors.

1.4 DRAWINGS FURNISHED BY THE ARCHITECT

A. The Drawings show plans and elevations of the project together with such details as can be conveniently shown. The work shall conform to these drawings and such additional drawings as will be furnished from time to time during construction, including such changes of details as will be furnished from time to time during construction, including such changes of details as the Architect may consider necessary on account of conditions that are found to exist during the execution on the work. The Contractor shall check all drawings and shall be responsible for the correct fittings together and exact position of all parts of the work. All of the drawings form a part of these specifications.

B. SCOPE: Under no circumstances will bids be submitted or work performed with uncertainty. Questions pertaining to work that do not appear to be sufficiently detailed or explained, or pertaining to the true meaning of any part of the plans or specifications shall be referred to the Architect for clarifications. After execution of the contract, no allowances will be made in favor of the Contractor for failing to check dimensions and methods of construction on the plans and the site and reporting any discrepancies to the Architect.

C. WORDING OF SPECIFICATIONS: In order to emphasize the technical provisions and to obtain brevity, the phrases "The contractor shall: Furnish all labor and materials" have at times, been omitted from these specifications. Where the word "provide" appears, interpret it to mean "Furnish all Labor, Materials, and equipment necessary for completed installation." Where "you" is inferred as for example, "set in place this item," the inferred "you" means the contractor (or subcontractor) shall.

D. CORRELATION OF DRAWINGS AND SPECIFICATIONS: Generally, the drawings indicate dimensions, while the specifications indicate quality and application of materials. Work indicated on the drawings and not mentioned in the specifications, or vice versa, shall be furnished as though fully set forth in both. Work not particularly detailed, marked or specified shall be the same as similar work that is detailed, marked or specified.

E. ERRORS: Should an error appear in the drawings or specifications, or in the work done by others affecting this work, the contractor shall notify the Architect at once and the Architect will issue instructions as to procedure. If the contractor proceeds with the work so affected without instructions from the Architect, he (the Contractor) shall make good any resulting damage or defects. This includes typographical errors in the specifications and notational errors on the drawings.

1.5 SECURITY / PROTECTION

A. The Contractor shall provide such temporary walks, fences, or other protective structures as are necessary or required for public safety, provide sufficient night guards adjacent to all obstructions during darkness which may be necessary. Protection of the work and

safety precautions are the total responsibility of the General Contractor.

B. Contractor shall provide a 6 foot tall security fence around entire perimeter of the project.

C. Contractor shall comply with South Texas College’s employee conduct policy.

D. Contractor shall comply with South Texas College’s weapons policy.

E. South Texas College shall provide Contractor with all current phone numbers in case of emergency. Contractor shall communicate with campus police in the event of an emergency.

1.6 EXAMINATION OF DRAWINGS AND SPECIFICATIONS

A. Before submitting a bid, bidders shall carefully examine and read the drawings and specifications, shall fully inform themselves as to all existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the contract. Submitting a bid creates a conclusive presumption that these items have been accomplished.

1.7 EXAMINATION OF SITE:

A. Each subcontractor before submitting proposal for this project shall have examined the site and satisfied himself as to the existing conditions under which he will be required to work, or that, in any way, will affect the work under this contract. No allowance will be made on behalf of the Contractor for any error or negligence in determining these existing conditions.

B. Building permit fees are required by State, County or City laws, ordinance and regulations shall be paid by the Contractor. Give all notices necessary in connection therewith.

C. All work shall comply with local and other governing codes, ordinances and regulations, but these requirements do not relieve the Contractor of the responsibility for complying with specifications if the requirements exceed those of governing codes and regulations.

1.8 SUBCONTRACTS

A. Sections in these specifications conform roughly to customary trade practice. They are used convenience only. The Contractor is not bound to define the limits of any subcontract.

1.9 LAYING OUT WORK:

A. Contractor shall, immediately upon entering project site for purpose of beginning work, locate all general reference points and take such action as is necessary to prevent their destruction; lay out his own work and be responsible for all lines, elevations and measurements of building, utilities and other work executed by him under the Contract. He must exercise proper precaution to verify figures shown on the Drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution. A licensed surveyor shall be employed by the Contractor to set grades, lay out buildings, parking areas and improvements.

1.10 DATA AND MEASUREMENTS AND EXAMINATION:

A. The data given herein and on the Drawings is as accurate as could be secured. Their absolute accuracy is not guaranteed and the Contractor shall obtain exact locations, measurements, levels, etc., at the site and shall satisfactorily adapt his work to actual conditions at the project. The Contractor shall examine all drawings including mechanical and electrical and specifications. Drawings are to remain property of Architect.

1.11 DELIVERY AND STORAGE OF MATERIALS:

A. Each Contractor shall make his own provisions for the delivery and safe storage of his materials and shall make required arrangements with the Contractors for the introduction into the building of equipment too large to pass through finished openings. Materials shall be delivered at such stages of work as will expedite the work as a whole and shall be marked and stored in such a way as to be easily checked and inspected.

B. The Contractor shall be responsible for adequately protecting all utilities, supplies, and equipment for the work both cold and hot weather. All items subject to such weather damage shall be protected by covering, insulating, or stores in a conditioned space.

1.12 CONTRACTOR'S GUARANTEE:

A. Refer to Section 01 78 36.

1.13 STANDARDS:

A. All materials used shall meet the latest standards of the American Society for Testing Materials (ASTM) where applicable or as specified herein.

1.14 MANUFACTURER'S INSTRUCTIONS

A. Install manufactured items in strict accordance with manufacturer's instructions and recommendations. Provide accessories and incidentals recommended by the manufacturer for proper installation.

B. Furnish to the Architect three (3) complete sets of operating and maintenance instructions and demonstrate to the Owner the procedures for proper operation and functioning of all equipment.

1.15 SYMBOLS:

A. Items of equipment and materials are indicated on the Drawings in accordance with the symbols shown on the plans.

1.16 ABBREVIATIONS:

A. The word "Approved" as used herein means "Approved by Architect and Owner", "For Approval" means "For the Architect and Owner's Approval". "Selected" means "Selected by the Architect and Owner". "ASTM Specifications" means "Standard Specifications of the American Society for Testing Materials, 1916 Race Streets, Philadelphia 3, Pa."

"ASME Code or Approved" means "American Society of Mechanical Engineers Applicable Code, Test, or Requirements, 29 West 39th Street, New York". "NFBU means "National Board of Fire Underwriters, 85 John Street, New York 38, New York". "UL" means "Underwriters Laboratories, Inc., 207 East Ohio Street, Chicago, Illinois".

1.17 NUMBER OF SPECIFIED ITEMS REQUIRED:

A. Where in these Specifications an article, device or piece of equipment is referred to in the singular number, such reference shall apply to as many such article as are shown on the Drawings or required to complete the installation.

1.18 EQUIVALENTS:

A. Where, in the specifications, one certain kind of brand of manufacturer or material is named, it shall be regarded as the required minimum standard of quality. Proposed substitutes may be written and presented as deviations of specifications for review by the Architect. Do not proceed with substitution unless authorized by Architect or Owner.

1.19 PROJECT SIGN: SIGNS AND ADVERTISING:

A. Provide and erect a 4' x 4' sign for which a layout will be provided and which state the following:
   1. Name of the Project and Owner
   2. Names of Board of Trustees
   3. Name of Architect
   4. Name of General Contractor

B. Do not erect signs without approval of the Architect.

C. Signs advertising material or subcontractors will not be allowed.

1.20 TEMPORARY FIELD OFFICE:

A. General Contractor shall provide and maintain a temporary weather tight field office at the site, equipped with telephone, lights, plan desks and plan files. Office shall be of sufficient size for use of Contractor and Architect's Representative. Office may be an area within the project area designated as such and shall be removed when work is completed.

B. The telephone at the job office shall be in operation from commencement of construction at the site until the acceptance of all building(s).

1.21 TEMPORARY UTILITIES:

A. UTILITIES: General Contractor shall make arrangements for and furnish, at his own expense, all water, electricity, lighting, telephone, and other utilities necessary for construction purposes, as required to adequately complete this contract.

B. TEMPORARY WIRING: The Electrical Contractor shall provide temporary connections for fan motors, oil burners, etc., when heat or ventilation is required during the course of construction of the project.

C. The Electrical Contractor shall also provide temporary power and lighting facilities to include the following:

C. Approved service connections and metal installations from the nearest power service to point convenient for and available to all trades.

D. Each Contractor shall provide, at his own expense, temporary wiring from the temporary service to the places where his work is being performed.

E. The General Contractor shall pay for all electricity used by Contractors for temporary light and power.

1.22 TEMPORARY TOILETS:

A. General Contractor shall provide and maintain temporary toilets as necessary for use of workmen. Locate toilets where directed. Keep toilets in sanitary condition. All sanitary arrangements shall be acceptable to public authorities having jurisdiction.

1.23 TEMPORARY ENCLOSURES:

A. All openings shall be closed as necessary to retain temporary heat and to prevent rain and snow from entering the building.

1.24 ELECTRICAL

A. Each Contractor shall furnish all equipment pertaining to his work, including motors, relays, control devices, etc. The Electrical Contractor shall furnish and install all disconnect switches and motor starters except those in "prewired" or package" unit. Multi-speed starters shall be furnished by the Contractor supplying the equipment to be controlled.

B. Each Contractor shall install motors pertaining to his work and all equipment except those requiring only line voltage connections. These items shall be installed and connected by the Electrical Contractor.

C. Each Contractor shall submit complete wiring and control diagrams for Architect's approval and be responsible for proper operation. Wiring shall be in accordance with the Drawings and Specifications and per approved Wiring Diagrams. The Electrical Contractor shall be responsible for proper overload protection for all motors.

D. Prior to submitting his bid, the Electrical Contractor shall examine the General and Mechanical Drawings and Specifications to clarify the extent of his work.

1.25 CODES:

A. The Contractor is to perform the work in accordance with the respective codes involved and the codes which apply to the project area. Also, all materials, installation, and work must conform to all applicable federal, state, county and city regulations, laws and ordinances.

B. No claims for additional payment will be approved for changes required to comply with

codes, ordinances, and regulations governing electrical and mechanical services and installation, since it is the Contractor's responsibility for familiarizing himself with such requirements before submitting his proposal.

1.26 PERMITS, FEES, INSPECTIONS AND ASSESSMENTS:

A. Each Contractor and Subcontractor shall take out and shall pay for all permits, fees, licenses, and inspections required by state and/or local authorities which pertains to his portion of work.

1.27 EQUIPMENT AND CONSTRUCTION METHODS:

A. The Contractor shall be responsible for the equipment and methods used in the erection of his work covered by the Contract, but the Owner reserves the right to approve such equipment and methods.

B. If, at any time, the Contractor's working force, in the opinion of the Architect and Owner, shall be inadequate for securing the necessary progress, as herein stipulated, the Contractor shall, if so directed, increase the force or equipment to such extent as to give reasonable assurance of compliance with the schedule of progress, but the failure of the Architect to make such demand shall not relieve the Contractor of his obligation to secure the quality, the safe conduct of the work, and the rate or progress required by the safety, efficiency and adequacy of his plan, appliance and methods.

C. Workmanship shall be of the best. The good appearance of finished work shall be of equal importance with its mechanical efficiency.

D. No makeshifts will be permitted anywhere in the work, and all portions of the work shall be so laid out and installed that the work as a whole is of uniform quality and appearance.

1.28 CLEANING

A. Refer to Section 01040, 01311, and 01700.

1.29 SUBSTITUTION FOR MATERIALS SPECIFIED:

A. Whenever a material, article or item of equipment is identified in the Contract Documents by reference to manufacture's names, trade names, catalog numbers, etc., it is intended to establish the minimum standard required. Any material, article, or equipment of other manufactures which will adequately perform may be proposed for substitution. Such proposals must receive the opinion of the Architect, that they are of equal substance and function and then receive the approval of the Owner. Such items shall not be purchased and used without first the Architect's approval and then the approval of the Owner.

B. All items of materials or equipment proposed by Contractor as equal substitutions for items of material or equipment which are specified as "Similar To" or "Equal To" shall be equal in every respect to the quality, quantity, performance, appearance, color, finish, gauge, and size of that item which has been used as a basis of equality.

C. The entire cost of all changes of any type necessitated by the substitutions for the material or equipment as specified shall be borne entirely by the Contractor making the

substitution at no extra cost to the Owner and with no extension of time.

D. Submit 3 copies of each request for substitution. In each request identify the product or fabrication or installation method to be replaced be the substitution; include related specification section, drawing numbers, and complete documentation showing compliance with the requirements for substitutions. All substitutions shall be made no later than seven (7) days before bids are revealed.

E. Should a substitution to accepted and should the submitted item prove defective or otherwise unsatisfactory for the function intended and within the warranty period, it shall be replaced with the material or equipment specified, without any additional cost to the Owner.

F. All substitutions must be approved IN WRITING BY ADDENDUM by the Architect. Without this written approval, no changes or any description within the contract documents will be authorized.

G. The Architect reserves the right to reject any material and/or workmanship either before or after installation which is not indicated in the plans and specifications or the substitutions of which has not been approved by the Architect in writing.

H. The Architect/Owner shall select all colors on building materials.

1.30 EXTRA COMPENSATION

A. Claims for extra compensation shall be made in writing to the Architect before proceeding with the work for which claim is made, in accordance with the provisions of the General Conditions. In the event of dispute, it shall be settled by arbitration in accordance with the procedure set forth in the General Conditions.

B. Reasonable extra compensation will be allowed for changes or additions authorized in writing by the Architect with the approval of the Owner. Such authorization must be given before the work is performed.

C. Extra compensation will not be authorized for work which, though not specifically detailed or specified or is reasonably inferable and/or obviously necessary to maintain the quality of construction and finish established by the plans and specifications.

1.31 MISCELLANEOUS:

A. Each Contractor shall be responsible for the various hangers, sleeves, openings, anchorage, fittings, and other things necessary to the accomplishment of the work.

B. Each Contractor shall be responsible for such excavation and backfilling as shall be required. Backfill, which settles, shall be taken out and re-compacted at no cost to the Owner.

1.32 TESTING:

A. Material testing consultant shall be selected and paid for by the Owner unless otherwise noted.

1.33 OCCUPATIONAL SAFETY AND HEALTH ACT:

A. It shall be the responsibility of the Contractor and/or Contractors to comply with all the requirements of the Occupational Safety and Health Act of 1970 by the U.S. Department of Labor and to require all its subcontractors and employees to comply with this law, and any related State or local laws.

1.34 TEXAS ACCESSIBILITY STANDARDS (TAS):

A. It shall be the responsibility of the Contractor and/or Contractor to comply with the 2012 Texas Accessibility Standards (TAS), Elimination of Architectural Barriers, Texas Government Code, Chapter 469, administered by the Texas Department of Licensing and Regulation.

1.35 FAIR EMPLOYMENT PRACTICES:

A. "In connection with the performance of work under this contract or purchase order, the Contractor or Supplier agrees as follows":

B. The contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The Contractor will take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color, or national origin. Such action shall include but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

1.36 RIGHTS OF THE OWNER TO TERMINATE CONTRACT

A. In the event that any of the provisions of this contract are violated by the Contractor, or any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the Contract, unless within the (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement for correction to be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination the Owner shall immediately serve notice thereof upon the Surety and the Contractor, provided however, that if the Surety does not commence performance thereof within five (5) days from the date of the mailing of such notice to Surety of termination, the Owner may take over the work and prosecute the same to completion by force amount at the expense of the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work such materials, appliances and plants that may be on the site of the work and necessary thereof.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 29 73 SCHEDULE AND PAYMENTS

PART 1 - GENERAL

1.1 PROGRESS REPORT

A. Provide reports at the end of each week to record progress and problems.

1.2 SCHEDULE OF VALUES

A. General: Each prime contractor shall prepare a schedule of values, as required be the General Conditions, in conjunction with the preparation of the progress schedule.

B. Coordinate preparation of the Schedule of Values with the preparation of the progress schedule.
   1. Correlate line items with other administrative schedules and forms required for the work, including the progress schedule, payment request form, listing of products and principal suppliers and fabricators and the schedule of submittals.
   2. Provide breakdown of the Contract Sum Value of the items, and the percentage of the Contract Sum to nearest one-hundredth percent and adjust to total 100 percent.

1.3 PAYMENT REQUEST

A. General: Except as otherwise indicated, the progress payment cycle for each prime Contractor is to be regular.
   1. Each application must be consistent with previous applications and payments.
   2. Certain applications for payment, such as the initial application, the application at substantial completion, and the final payment application involve additional requirements.

1.4 WAIVE OF LIEN

A. For each payment application, each prime contractor shall submit waivers of lien for each entity, (including Contractor) who could lawfully and possibility file a lien in excess of $100.00 arising out of the Contractor, and related to work covered by the payment.

B. Submit partial waivers for the amount requested, prior to deduction of retainage, on each item. When the application shows completion of an item, submit final or full waivers.

C. The Owner reserves the right to designate which entities involved in the work must summit waivers.

1.5 WAIVER FORMS

A. Submit waivers on forms, and execute in a manner, acceptable to Owner.

1.6 PAYMENT APPLICATION TIMES

A. The "date of each progress payment" for each prime Contractor is as indicated in Owner-Contractor Agreement or, if none is indicated therein, it is the 25th day of each month.

B. The period of construction work covered by each payment request is period indicated in Owner-Contractor Agreement or, if none is indicated therein, it is period ending 15 days prior to date for each progress payment, and period starts on day following end of preceding period.

1.7 PAYMENT APPLICATION FORMS

A. AIA Document G702 and Continuation Sheets; available from "Publications, a Division of The AIA Service Corporation", 1735 New York Ave., N. W., Washington, D. C. 20006 (also available at most local AIA chapter offices).

B. APPLICATION PREPARATION: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by the Architect without action. Entries must match current data of schedule of values, progress schedule and reports. Listing must include amounts on change orders issued prior to last day of the "period of construction" covered by application.

C. INITIAL PAYMENT APPLICATION: The principal administrative actions and submittals which must precede or coincide with submittal of each prime contractor's first payment application can be summarized as follows, but not necessarily by way of limitation:

1. Listing of subcontractors and principal suppliers and fabricators.
2. Schedule of principal products.
3. Schedule of submittals (preliminary if not final).
4. Listing of Contractor's staff assignments and principal consultants.
5. Copies of acquired building permits and similar authorizations and licenses from governing authorities for current performances of the work.
6. Performance and/or payment bond (if required).
7. Evidence satisfactory to Owner that Contractor's insurance converges have been secured.
8. Data needed by Owner to secure related insurance coverage.
9. Initial progress report, including report of pre-construction meeting.

D. APPLICATION AT TIME OF SUBSTANTIAL COMPLETION: Following issuance of Architect's final "certificate of substantial completion" on each prime contractor's work, and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application actions and submittal which must precede or coincide with such special applications can be summarized as follows, but not necessarily by way of limitations.

1. Occupance permits and similar approvals or certificates by governing authorities and franchised services, assuring Owner's full access and use of completed work.
2. Warranties (guarantees), maintenance agreements and similar provisions of contract documents.
3. Final cleaning of the work.
4. Listing of Contractors' incomplete work, recognized as exceptions to Architect's certificate of substantial completion.

E. FINAL PAYMENT APPLICATION: The administrative actions and submittal which must

precede or coincide with submittal of each prime contractor's final payment applications can be summarized as follows, but not necessarily by way of limitation:

1. Completion of project closeout requirements.
2. Completion of items specified for completion beyond time of substantial completion (regardless of whether special payment application was previously made).
3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.
4. Transmittal of required project construction records to Owner.
5. Certified property survey (Contractor for General Work).
6. Proof, satisfactory to Owner, that taxes, fees, and similar obligations of Contractor have been paid.
7. Removal of temporary facilities, services, surplus materials, rubbish and similar elements.
8. Consent of surety for final payment.

F. APPLICATION TRANSMITTAL: Each prime contractor shall submit 3 executed copies of each payment, applications, one copy of which shall be complete with waivers of lien and similar attachments. Transmit each copy with transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect. Transmit to Architect by means ensuring receipt within 24 hours.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 29 76 APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements necessary to prepare and process Application for Payment.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the work and used as the basis for reviewing Contractor’s Applications for Payment.

1.3 SCHEDULE OF VALUES:

A. Coordinate preparation of the Schedule of Values with the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other schedules and forms, including:
   a. Contractor's Construction Schedule.
   b. Application for Payment form.
   c. List of Subcontractors.
   d. List of Products.
   e. Schedule of submittals.

2. Submit the Schedule of Values to the Architect at the earliest date, but not later than 7 days before the date scheduled for submittal of the initial Application for Payment.

B. FORMAT AND CONTENT: Use the Project Manual Table of Contents as a guide to establish the format.

1. IDENTIFICATION: Include the following identification:
   a. Project name and location.
   b. Name of the Architect.
   c. Project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the Schedule in tabular form with columns to indicate the following for each item:
   a. Generic name.
   b. Description of the Work
   c. Name of Manufacturer or fabricator
   d. Name of Subcontractor
   e. Name of Supplier
   f. Dollar value.

g. Change Orders (numbers) that have affected value.
   1) Percentage of Contract Sum to the nearest one-hundredth percent, adjust to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate evaluation of Applications for Payment and progress reports. Break subcontract amounts down into several line items.

4. Round amounts off to the nearest dollar; total shall equal the Contract Sum.

5. Temporary facilities and items that are not direct cost of Work-in-place may be shown as separate line items or distributed as general overhead expense.

6. Update and resubmit the schedule when Change Orders or Construction Change Directives change the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: Use AIA Document G 702 and Continuations Sheets G 703 as the form for the application.

C. Application Preparation: Complete every entry, including notarization and execution by person authorized to sign on behalf of the Owner. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

D. TRANSMITTAL: Submit 3 executed copies of each application to the Architect within 24 hours; one copy shall be complete including waivers of lien and similar attachments.

E. WAIVERS OF LIEN: With each application, submit waivers of lien from every entity who may file a lien arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested, prior to deduction for retainage, on each item.

2. When an application shows completion on an item, submit final or full waivers.

F. INITIAL APPLICATION FOR PAYMENT: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include:
1. List of subcontractors.
2. List of suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule (preliminary of not final).
5. Submittal Schedule

6. List of Contractor's staff assignments.(preliminary if not final).
7. Copies of licenses from governing authorities.
8. Copies of building permits.
9. Certificates of insurance and insurance polices.
10. Performance and payment bonds (if required).

G. APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions. Administrative actions and submittals that precede or coincide with this application include:
   1. Occupancy permits.
   2. Warranties and maintenance agreements
   3. Test/adjust/balance records.
   4. Maintenance instructions.
   5. Master readings.
   6. Final cleaning.
   7. Application for reduction retainage, and consent of surety.
   8. Change-over information related to Owner's occupancy.

H. FINAL PAYMENT APPLICATION: Administrative actions and submittals which must precede or coincide with submittal of the final payment application include:
   1. Completion of Project closeout requirements.
   2. Completion of items specified for completion after Submittal Completion.
   3. Transmittal of required Project construction records to Owner.
   4. Certified property survey.
   5. Proof that taxes, fees, and similar obligations have been paid.
   6. Change of door locks to Owner's access.
   7. Final, liquidated damages settlement statement

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 33 23 SHOP DRAWINGS AND DATA AND SAMPLES

PART 1 – GENERAL

1.1 SUMMARY:

A. This section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Submit to Architect / Engineer, Shop Drawings, Product Data and Samples required by Specification Section.

C. Prepare and submit, with Construction Schedule, a separate schedule listing dates for submission and review of Shop Drawings. Products Data and Samples will be needed for each product.

1.2 SHOP DRAWINGS:

A. Original drawings, prepared by Contractor, Subcontractor, supplier or Distributor, which illustrate some portion of the work; showing fabrication, layout, setting or erection details. No portion of the Contract Documents shall be reproduced for use as a part of the Shop Drawings.

B. Shop drawings shall be prepared be a qualified detailer.

1.3 SUBMISSION REQUIREMENTS:

A. Schedule submissions at least two weeks before reviewed submittals will be needed.

B. Shop Drawings: Submit number of copies or Product Data which contractor requires for distribution plus two (2) copies which will be retained by Architect/Engineer. (Eight (8) copies total)

C. Product Data: Submit number of copies or Product Data which Contractor requires for distribution plus three (3) copies which will be retained by Architect/Engineer. (Eight (8) copies total)

D. Samples: Submit number of samples specified in each Specification Section.

E. Accompany submittals with transmittal letter in duplicate, containing:
   1. For work designed by consultants, make submission directly to consultant and simultaneously submit duplicate of transmittal letter to Architect.

F. Submittals shall include:
   1. Date and Revision Dates
   2. Project Title and Number
   3. The Names of: a. Architect/Engineer b. Contractor
      c. Subcontractor d. Supplier
      e. Manufacturer f. Separate detailer when pertinent
   4. Contractor's stamp, initialed or signed, certifying review of submittal verification of field measurements and compliance with Contract Documents.
   5. Identification of product materials
   6. Field dimension, clearly identified as such
   7. Applicable standards, such as ASTM or Fed. specification
   8. Identification of deviations

H. If shop drawings which have been previously submitted for review are resubmitted, they shall clearly note any changes or additions that have been made to the previous submittal.

1.4 RESUBMISSION REQUIREMENTS:

A. Shop Drawings:
   a. Revise initial drawings as required and resubmit as specified for initial submittal.
   b. Indicate on drawings any changes which have been made other than those requested by the Architect/ Engineer.

B. Product data and Samples: Submit new data and samples as required for initial submittal.

PART 2 – PRODUCTS

2.1 PRODUCT DATA: Collect information into a single submittal for each element of construction and type of product or equipment

A. Manufacturer's Standard Schematic Drawings:
   1. Modify drawings to delete information not applicable to project.

B. Manufacturer's Catalog Sheets, Brochures, Diagrams, Schedules, Performance Charts, Illustrations and other descriptive data.
   1. Clearly mark each copy to identify pertinent materials, products or models.
   2. Manufacturer’s written recommendations
   3. Manufacturer’s product specifications
   4. Manufacturer’s installation instructions
   5. Standard color charts
   6. Manufacturer’s catalog cuts
   7. Standard product operation and maintenance manuals
   8. Wiring diagrams showing factory installed wiring
   9. Testing by recognized testing agency
   10. Application of testing agency labels and seals
   11. Show dimensions and clearances required.
   12. Show performance characteristics and capacities.

C. Submit Product Data before or concurrent with Samples.

D. Number of Copies: Submit three copies of Product Data, unless otherwise indicated.

2.2 SAMPLES: Submit Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.

A. Office Samples: Of sufficient size and quantity to clearly illustrate:
   1. Functional characteristics of product or material.
   2. Full range of color samples.

B. Field Samples and Mock-Ups:
   1. Erect at Project Site at location acceptable to Architect.
   2. Construct each complete, including work of all trades required in finish work.

PART 3 – EXECUTION

3.1 CONTRACTOR’S REVIEW

A. Review each submittal and check for coordination with other work of the Contract and for compliance with the Contract Documents. Note correction and field dimensions. Mark with approval stamp before submitting to Architect.

3.2 CONTRACTORS RESPONSIBILITIES:

A. Review and Approve Shop Drawings, Product Data and Samples prior to submission and so indicate over his signature.

B. Verify:
1. Field measurements
2. Catalog numbers and similar data.
3. Field construction criteria
4. A. D. A. (American w/ Disabilities Act) requirements

C. Coordinate submittals with requirements of work and Contract Documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect/Engineer's review of submittal.

E. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by Architect/Engineer's review of submittals.

F. Notify Architect/Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

G. Begin no work which requires submittals until return of submittals with Architect/Engineer's stamp and initials or signature indicating review.

H. After Architect/Engineer's review, distribute copies.

3.3 ARCHITECT / ENGINEER DUTIES

A. General: Review submittals with reasonable promptness.

B. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

C. Review for
1. Design Concept
2. Information given in contract documents

D. Review of separate item does not constitute review of an assembly in which item functions.

E. Affix stamp initials or signature certifying review of submittal

F. Return submittals to contractor for distribution.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 33 24 FACILITIES MANAGEMENT DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Description:

1. This section specifies the standards that the Contractor shall follow for their scope of work related to Facilities Management Data Requirements. This section also includes information related to documents that are required for operations and maintenance support functions.

2. This section does not negate any other section that requires Commissioning or Operations & Maintenance Data (or documents).

3. Part 3 includes information about owner provided tools for managing the facilities management data and documents.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Facility Equipment Information

1. **Content**: The Contractor will provide facilities information, that is:

a. Contact Information (email, company name, website, phone number) per the following:
   i. General Contractor(s)
   ii. Provide contact information for sub-contractors installing products from ‘equipment information’ section below.
   iii. Provide contact information for manufacturers providing equipment from ‘equipment information’ section below.
   iv. Example: info@trane.com, Trane, trane.com, 999.999.9999

b. Spatial Information:
   i. Provide room number, room name, and floor number.
   ii. Example: M107, Main Mechanical Room, 01

c. Equipment Information: For a list of the expected equipment types, see Table 01-Required Equipment List.

Note: Equipment Types are typical categories of assets with common characteristics and attributes that match equipment groups in the owner’s

operational systems. Effort has been made to align the information requested during construction to the format and content of the operational systems that will receive the information after turn-over to operations. Table 01 is a master list of equipment (or asset) types that Operations requires to the extent that this equipment is part of the final construction scope of work (new and renovation).

i. Construction Start Data: equipment name (tag number), equipment location / room number, equipment description, asset type
   1. Example: AHU-ME001, M107, Air Handler, AHU
   2. This is information that can be assembled from the initial set of GMP construction documents. This is the first building block of the FM requirements that can be initiated prior to the development of submittals and their approvals.

i. Submittal Data: installer, manufacturer, model, approximate cost, expected life, warranty duration, associated approved submittal
   1. Example: HVAC Installers, Trane, C1000, $125,000, 30 years, 5 years, 23 00 10 - Air Handlers.pdf
   2. This is information that will be added to the FM data once submittals are approved and specific equipment information has been determined.
   3. Associated approved submittal file names shall be coordinated so what is uploaded to O&M Logger (See Part 3) corresponds and includes only the relevant information as opposed to an entire specification section of documents. The intent is to right-size the attachments to match the specific equipment type.

ii. Install Data: serial number
   1. Example: 100045312

iii. Close-Out Data: Associated commissioning reports (if applicable), associated O&M documents, associated warranty documents
   1. Example: CX-AHU1.pdf, OM-AHU1.pdf, Warranty-AHUs.pdf
   2. File naming conventions shall be coordinated with the owner to ensure a consistent approach and to eliminate rework before upload to the owner provided tool (O&M Logger).

b. Referenced Documents:
   i. Associated electronic files of referenced documents from ‘spatial information’ and ‘equipment information’ as written above.
   ii. File names of electronic files shall match what is referenced in appropriate fields for document name.
   iii. When the web-based tool is used, this will be accomplished during the upload process.

2. **Deliverable Format:** The owner provided tool shall be used by the Contractor to accumulate and organize the information required by this specification section. However, in order to document the final turnover of information, the following hard copy deliverables have been determined to allow for transmittal from the Contractor to the Owner. The Contractor will provide facilities information, per the following:

    a. Contact, spatial, and equipment information shall be provided in spreadsheet format. For an example of spreadsheet deliverable, see Table 02 - Example Data Format. This can also be exported from O&M Logger.

    b. Referenced documents shall be provided in electronic format and organized per the following:
        i. Parent folder named by building number (ex. 1416) and year of substantial completion (2016). (full example: 1416-2016)
        ii. Sub-folders named by document type (Submittals, O&Ms, Cx, Drawings, As-Builts, Warranties).
        iii. For an example of referenced document deliverable (See Table 03 - Reference Document Example)

3. **Schedule:** The Contractor shall provide equipment information throughout the project as the information becomes available and approved for use. As seen in a previous section (equipment information), each set of fields are named to indicate the expected phase the data is to be provided in. They include: 1) construction start data, 2) submittal data, 3) install data, and 4) close-out data.

    a. The first set of fields will be those data points that are provided by the Contractor at construction start.
    b. The second set of fields will be those data points that are to be provided by the Contractor during the submittals stage.
    c. The third set of fields will be those data points that are to be provided by the Contractor during the install / inspection stage.
    d. The last set of fields will be those data points that are to be provided by the Contractor during the close-out stage.

    Reasonable milestone dates for each of the four data deliverable phases shall be provided by the Contractor for approval by the Owner at construction start. It is understood that some information may lag in the development cycle for construction, such as the completion of all submittals. The intent is for the Contractor to make reasonable progress on the FM Data deliverables over the duration of the construction effort and not to defer the effort until the final months of the project. The entirety of the final data is to be completed within two weeks after substantial completion.

4. **Final Deliverable**: The Contractor shall provide three copies of final deliverables to the owner not less than two weeks after substantial completion on a flash drive. Deliverable data shall match what is within the owner provided tool (O&M Logger), and shall be in spreadsheet format. This spreadsheet can be achieved by “exporting” the final deliverables from the electronic tool. Format of deliverables, content, and schedule are addressed in other parts of this specification section. The related documents will have already been uploaded to O&M Logger but an archive file shall also be handed over to the owner by the Contractor.

End of this section contains all tables.

Table 01 - Required Equipment List
Table 02 - Example Data Format
Table 03 - Reference Document Example

PART 3 - EXECUTION

3.1 Process

A. Submission and Review of Facilities Information

The Contractor shall provide the completed data fields at the end of each major phase of construction as indicated in the schedule section above. Data shall be submitted to owner at agreed upon milestone dates. The owner shall periodically review data for accuracy with documents and field conditions. Following review, the owner will provide the contractor with an issue report. Issue reports will contain any discovered deviations from field conditions or inaccuracies of facilities data for correction. Any identified deviations from field conditions (issues) will require the contractor to correct and resubmit the data within two weeks of receiving the issue report.

B. Tools for Use

1. The Contractor shall establish and maintain the facilities data within the owner provided tool (O&M Logger). The tool has been pre-configured with all of the corresponding pick-lists from the included Tables in this specification. The tool is part of the implementation process for collecting and verifying facilities management data and related documents. Use of O&M Logger will ensure applicable equipment naming standards are followed and provide constant viewing / non-editing access to the owner for on-going review and comment in the field or in the office. The owner provided tool will be made available at no charge to the project personnel. The tool will allow for import of spreadsheet data if a different tool is employed for data collection by the Contractor. Additional details and necessary training for the provided tool will be available at the start of data collection.

2. The electronic tool is being provided and employed for several reasons. First, to streamline the organization of the facilities management data and to serve as an aid

to the Contractor in complying with the associated Tables in this specification. Second, the related documents can be properly organized by uploading them to the tool. Third, the Contractor has an option to allow access to the tool to select sub-contractors who can assist with facilities management data / document population. Fourth, independent reviews of the data can be conducted by the owner and/or the owner’s representative for quality purposes during the construction process. Using a web-based tool allows for the owner to have access to the information, as needed, and transparency about Contractor progress. The tool also includes a number of reporting functions. These reports are built from the included data in O&M Logger.

C. Summary of Owner vs Contractor Scope

1. Construction Team Responsibilities - Provide equipment information in O&M Logger (examples follow):
   i. Construction Start Data
   ii. Submittal Data
   iii. Install Data
   iv. Close-Out Data
   v. Referenced Documents

2. Owner Responsibilities

   a. Oversee data collection for project, examples follow:
      i. Review and confirm Contractor’s facility data submittal schedule.
      ii. Review data for accuracy and specification compliance.
      iii. Provide status reports to management.
      iv. Answer questions from project team members.

   b. Provide data collection tool, O&M Logger
      i. Free of charge to team members.
      ii. Support project team by project setup and any necessary training.

   c. Work with STC to import FM data into Asset Management System (School Dude).

Table 01 - Required Equipment List

Abbreviated	Asset Groups	Comments	System
ADO	Automatic Door Opener	proximity detection / auto opening	elec
AHU	Air Handler Unit		hvac
BF	Backflow Preventer Device	RPZ, etc.	plumb
BLR	Boiler		hvac
CB	Circuit Breaker	panelboard/ distribution panel	elec
CH	Chiller		hvac
CHWP	Chilled Water Pump		hvac
COMP	Building Compressor		plumb
CON	Condenser	condensing unit	hvac
CT	Cooling Tower		hvac
CWP	Condensate Water Pump		hvac
DWP	Domestic Water Pump		plumb
EF	Exhaust Fan	roof top unit (not small residential/commercial)	hvac
EG	Emergency Generator		elec
ELV	Elevator		convey
FCU	Fan Coil Unit		hvac
FIRE-PNL	Fire Panel		fire
FP	Fire Pump	fire pump	fire
HEX	Heat Exchanger		hvac
HOOD	Vent Hood		hvac
HWP	Heating Water Pump		hvac
IRR-MASTER	Irrigation Master Valve		grounds
JP	Jockey Pump	fire jockey pump	fire
MEC	Modular Equipment Controller	BAS panel	hvac
P	Misc Pump		plumb
PU	Packaged Unit	packaged air conditioner	hvac
ROOF	Roof	per type	roof
RTU	Roof Top Unit		hvac
SG	Switchgear	main switch gear	elec
SPT	Split System	split system air handler	hvac
T	Misc Tank	expansion tank, flash tank, etc.	hvac
TS	Transfer Switch		elec
VAC	Building Vacuum		plumb
VAV	Variable Air Volume Box	fan powered	hvac
VFD	Variable Frequency Drive		elec
WH	Water Heater		plumb
XFMR	Transformers		elec

Table 02 - Example Data Format

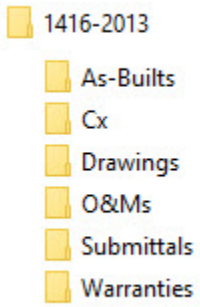
Space Information - Tab				
Number	Name	Floor	SF	Ceiling Height
100	LOBBY	1	1413	12
101	FOOD PREP	1	3648	12
102	DINING	1	4516	12
103	IT	1	40	12
104	UNISEX	1	75	12
105	MEN	1	288	12
106	WOMEN	1	289	12
110	MECHANICAL	1	292	12
111	STAIR	1	81	12
112	OFFICE	1	81	12
113	CUSTODIAL	1	257	12
114	OFFICE	1	96	12
115	OFFICE	1	96	12
116	OFFICE	1	96	12
117	OFFICE	1	159	12

Contact Information - Tab			
Email	Company Name	Website	Phone Number
info@CUMMINSPOWERGENERATION.com	CUMMINS POWER GENERATION	www.CUMMINSPOWERGENERATION.com	123-456-7890
info@YORK.com	YORK	www.YORK.com	123-456-7890
info@JOHNSONCONTROLS.com	JOHNSON CONTROLS	www.JOHNSONCONTROLS.com	123-456-7890
info@PENTAIR.com	PENTAIR	www.PENTAIR.com	123-456-7890
info@RECOUSA.com	RECOUSA	www.RECOUSA.com	123-456-7890
info@GENERALELECTRIC.com	GENERAL ELECTRIC	www.GENERALELECTRIC.com	123-456-7890
info@MARATHON.com	MARATHON	www.MARATHON.COM	123-456-7890
info@TDINDUSTRIES.com	TD INDUSTRIES	WWW.TDINDUSTRIES.COM	123-456-7890

Table 02 - Example Data Format (continued)

Equipment Information - Tab			
Equipment Name	AHU-ME001	CHWP-M001	FCU-MN001
Type	AHU (Air Handler Unit)	CHWP (Chilled Water Pump)	FCU (Fan Coil Unit)
Location	153	100	235
Equipment Description	Air Handling Unit	Chilled Water Pump	FAN COIL UNIT
Installer	hvac contractor, inc	hvac contractor, inc	hvac contractor, inc
Manufactur	Rheem	TACO	York
Model Number	RHPN-HM6024JL	WWEM4018324T	BH030W2B607L000
Original	$ 30,000	$ 5,000	$ 3,000
Life Expectancy (years)	20	15	20
Warranty Duration	5	2	1
Approved Submittal	Submittal-AHU.pdf	Submittal-CHW.pdf	Submittal-FCU.pdf
Serial Number	W211184641	GE07035	2182 05/00
O&M Document	OM-AHU.pdf	OM-CHW.pdf	OM-FCU.pdf
Warranty Document	Warranty-AHU.pdf	Warranty-CHW.pdf	Warranty-FCU.pdf
Commissioning Report (if applicable)	Cx-AHU.pdf	Cx-CHW.pdf	Cx-FCU.pdf

Table 03 - Reference Document Example



END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 40 00 PROJECT COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Coordination Drawings
   2. Administrative and supervisory personnel
   3. Project Meetings
   4. Requests for Interpretation (RFI’s)

B. Each contactor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.2 DEFINITIONS

A. RFI: Request from contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION:

A. Coordinate various elements of the work and entities engaged to perform work; and coordinate the work with existing facilities/conditions, and with work by separate contractors (if any) and by Owner.

B. Coordinate Contractor’s Construction Schedule with the Schedule of Values, list of subcontractors, Submittals Schedule, progress reports, payment requests and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.4 PROJECT MEETINGS

A. Construction Progress Meetings: Twice a month with Design Team, Contractor, and Owner present. More frequent if requested by Owner. Contractor shall provide meeting agenda.

B. The agenda of the second of the monthly construction meetings shall include the review of the contractor’s payment application.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's installation instructions and recommendations to the extent that printed information is more detailing or stringent than requirements contained directly in contact documents.

3.2 CLEANING AND PROTECTION:

A. Clean each element of the work at the time of installation. Provide sufficient maintenance and protection during construction to ensure freedom from damage and deterioration at time of substantial completion.

B. The contractor shall maintain areas free from hazardous or obstructive rubbish and debris, due to performance of the general work, during construction. All rubbish shall be confined to the project and not allowed to contaminate adjacent properties. The work shall be continuously cleaned. Refuse and debris to be placed in containers provided by the Contractor for removal not less than weekly and more often as required for cleanliness.

C. When the electrical systems have been installed, the contractor shall remove all rubbish and debris from the building site, remove all paint, plaster and accumulated dirt from all equipment, fixtures, and piping. At completion of the project, the project shall be cleaned and dusted and all glass surfaces polished clean. All the Contractor's tools construction equipment, machinery, and surplus materials shall be removed from the project site. Entire project site shall be raked with all debris 3/4" dia. or larger removed and hauled to approved landfill.

3.3 ACCESS:

A. The Contractor shall provide latrines for use of his employees. Contractor's employees will not be allowed to use building facilities.

3.4 SAFETY:

A. The contractor shall note that the Owner will assume no responsibility for the safety of the Contractor's employees. THE SAFETY OF THE CONTRACTOR'S EMPLOYEES IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

B. The Contractor shall also cordon off areas with equipment, traffic, etc. for the general safety of the public and Owners.

3.5 PROTECTION:

A. The Contractor shall provide such temporary walks, fences, or other protective structures as are necessary or required for public safety, provide sufficient night guards adjacent to all obstructions during darkness which may be necessary. Protection of the work and safety precautions are the total responsibility of the General Contractor.

3.6 SECURITY:

A. The Contractor shall provide a 6 foot tall security fence around entire perimeter of the project.
B. The Contractor shall assume full responsibility for protection and safekeeping of materials and/or equipment stored on premises.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 45 00 CUTTING AND PATCHING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, include General and Supplementary Conditions and other Division-1 Specification sections, apply to this section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for cutting and patching.

1.3 DEFINITIONS

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

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

1.4 QUALITY ASSURANCE

A. STRUCTURAL WORK: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

B. Obtain approval of the cutting and patching proposal before cutting and patching but, not limited to the following structural elements:
   1. Timber and primary wood framing.
   2. Species const. specified div. 13
   3. Foundation construction
   4. Structural decking
   5. Bearing and retaining walls
   6. Stair systems
   7. Structural concrete
   8. Miscellaneous structural metals
   9. Structural steel
   10. Exterior curtain wall construction
   11. Lintels
   12. Equipment supports
   13. Piping, ductwork, vessels and equipment

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
   1. Water, moisture or vapor barriers.
   2. Membranes and flashings

3. Equipment supports
4. Piping, ductwork, vessels, and equipment
5. Noise and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal.
   1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
   2. Describe anticipated results in terms of changes to existing construction; include change to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
   3. List products to be used and firms or entities that will perform work.
   4. Indicate dates when cutting and patching is to be performed.
   5. List utilities that will be disturbed or affected, include those that will be relocated and those that will be temporarily out of service. Indicate how long service will be disturbed.
   6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to shown how reinforcement is integrated with the original structure.

PART 2 - PRODUCTS:

2.1 MATERIALS: Use materials that are identical to existing materials.

A. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 – EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding if unsafe or unsatisfactory conditions are encountered.

B. Before proceeding, meet at the site with parties involved in cutting and patching, include mechanical and electrical trades. Review areas of potential interference and conflict before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place constructions during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. CUTTING: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
   1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

C. PATCHING: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

   1. Inspection: Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original conditions.

   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaced in the new space. Provide an even surface of uniform finish, color, texture and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final coat over entire unbroken surface containing the patch. Provide additional coats until the patch blends with adjacent surfaces.

   4. Ceilings: Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.

D. CLEANING: Thoroughly clean areas and spaces where cutting and patching is performed or use as access. Remove paint, mortar, oils, putty and items of similar nature completely. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 45 13 ALTERATIONS

PART 1 GENERAL

1.1 SUMMARY

A. The procedures and administrative requirements of this Section apply to all of the following Sections of the specifications which are involved in alterations to the existing building.

1.2 EXTENT NOTES

A. Cut into or partially remove portions of the existing building as necessary to make way for new construction. Include such work as:
   1. Cutting, moving, or removal of items shown to be cut, moved or removed.
   2. Cutting, moving, or removal of items not shown to be cut, move or removed, but which must be cut, moved or removed to allow new work to proceed. Work or items which are to remain in the finished work shall be patched or reinstalled after their cutting, moving or removal, and their joints and finishes made to match adjacent or similar work.
   3. Removal of existing surface finishes as needed to install new work and finishes.
   4. Removal of abandoned items and removal of items serving no useful purpose, such as abandoned piping or wiring.
   5. Repair or removal of dangerous or unsanitary conditions.
   6. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings, debris, and rotted wood.

1.3 SCHEDULING AND ACCESS

A. OUTAGES: Utility and service outages shall be kept to a minimum, and will be permitted only with permission from Owner.

B. SECURITY: When keys for locked areas are need to perform work, obtain from Owner. Return keys at end of each day's work.

C. ACCESS BY OWNER: The Owner shall have access to the building at all times during adjacent work.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 ALTERATIONS, CUTTING AND PROTECTION

A. EXTENT: Cutting and removal work shall be performed so as not to damage adjacent work.

B. RESPONSIBILITY AND ASSIGNMENT TO TRADES: Contractor shall assign the work of moving, removal, cutting, patching and repair to trades under his supervision so as to cause the least damage to each type of work encountered, and so as to return the building as much as possible to the appearance of new work.

1. Patching of finish materials shall be assigned to mechanics skilled in the work of the finish trade involved.

C. PROTECTION: Protect remaining finishes, equipment, and adjacent work from damage caused by cutting, moving, removal and patching operations. Protect surfaces which will remain a part of the finished work.

D. DISCOVERIES: Construction, furnishings, and articles of a historic or private nature, which are encountered during cutting, removal and new construction, shall be turned over to the Owner, or if the Owner desires for the disposition shall be sought and followed.

E. SALVAGE:
1. Salvage sufficient quantities of cut or removed material to replace damaged work or path new work, where the material cannot be readily obtained in today's market.
2. In addition to items specified above or indicated on the drawings to be salvaged, items marked or listed for salvage shall remain the property of the Owner and shall be carefully removed and store in a dry, secure place.
3. Do not incorporate salvaged or used materials in new construction, except for small quantities of finish material which are difficult to match.

F. DEBRIS: Remove debris promptly from the site each day. Removed material becomes the property of the Contractor. Load removed material directly onto trucks for removal from site. Dispose of removed material legally. Do not burn material on site and do not allow debris to enter sewers.

3.2 PATCHING, EXTENDING, AND MATCHING:

A. SKILL: Patch and extend existing work using skilled mechanics who are capable of matching the existing quality of workmanship. The quality of patched work or extended work shall not be less than specified in Sections of the product and execution Specifications which follow these General Requirements.

B. PATCHING:
1. In areas where any portion of an existing finished surface is damaged, lifted, stained or other wise made imperfect by work of this contract, patch or replace the imperfect portion of the surface with matching material.
2. Provide adequate support or substrate for patching of finishes.
3. If the imperfect surface was a painted or coated one, repaint or recoat the patched portion in such a way that uniform color and texture over the entire surface results.
4. If the surrounding surface cannot be matched, repaint or recoat the entire surface.

3.3 QUALITY

A. In the Sections of the product and execution specifications which follow these General Requirements, no concerted attempt has been made to describe each of the various existing products that must be used to patch, match, extend or replace existing work. Obtain all such products in time to complete the Work on Schedule. Such products shall be provided in quality which is in no way inferior to the existing products.

B. The quality of the products that exist in the building, as apparent during pre-bid site visits, shall serve as the Specifications requirement for strength, appearance, and other characteristics.

3.4 TRANSITIONS

A. Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Patched work shall match existing adjacent work in texture and appearance as to make the patch or transition invisible to the eye at a distance of 3 ft.

B. Where masonry, tile, plaster, metal or other finished surface is cut in such a way that a smooth transition with new work is not possible, terminate the existing surface in a neat fashion along a straight line at a natural line of division and provide trim appropriate to the finished surface.

3.5 MATCHING

A. Restore existing work that is damaged during construction to a condition equal to its condition at the time of the start of the Work.

B. At location in existing areas where partitions are removed, patch the floors, walls, and ceiling with finish materials to match adjacent finishes.

3.6 OVERALL REQUIREMENTS THAT THE WORK BE COMPLETED

A. Where a product or type of construction occurs in the existing building, and it is not specified as a part of the new work, provide such products or types of construction as needed to patch, extend or match the existing work.

B. These Specifications will generally not describe existing products or standards of execution, nor will they enumerate products which are not a part of the new construction. The existing product is its own Specification.

C. The presence of any product or type of construction in the old work shall cause its patching, extending, or matching to be performed, as necessary to make the work complete and consistent, to identical standards of quality.

3.7 REPAIR

A. Replace work damaged in the course of alterations, except at areas approved for repair.

B. Where full removal of extensive amounts of almost-suitable work would be needed to replace damaged portions, then filling, spackling, straightening, and similar repair techniques, followed by full painting or other finishing, will be permitted.

C. Examples of work that will frequently be approved for repair rather than replacement: pitting and concealed concrete surfaces, slightly bent ceiling runners, hairline cracks in plaster.

D. If the repaired work is not brought up to standard of new work, it shall be cut out and replaced with new work.

3.8 CLEANING:

A. EACH SUCCESSIVE TRADE: As each trade finishes its work on each part of the alteration work and related new work, it shall clean up its work area and make work surfaces ready for work of the succeeding trades.

B. Spillage, overspray, collections of dust or debris, and damage to Owner occupied spaces shall be cleaned or remedied immediately be the responsible trade.

C. EACH AREA AS IT IS COMPLETED: Clean up all surfaces, remove equipment, salvage and debris, and return in condition suitable for use by the Owner as quickly as possible.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 45 29 TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections apply to work specified in this Section.

1.2 PROCEDURE

A. Contractor's Testing Laboratory: An independent testing laboratory will be selected BY THE OWNER to inspect and test the materials and methods of construction as hereinafter specified for compliance with the specification requirements of the Contract Documents and to perform such other specialized technical services as required by the Owner or his representative. All testing lab services shall be paid for by the Owner, any re-testing shall be paid by the General Contractor

1.3 QUALIFICATIONS OF TESTING LABORATORY

A. The Testing Laboratory selected shall meet the basic requirements of ASTM E329 "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction", and shall submit to the Contractor, Owner, Architect, and Engineer, a copy of the report of inspection of their facilities made by the Materials Reference Laboratory of the National Bureau of Standards during the most recent tour of such inspections, and shall submit a memorandum stating steps taken to remedy all deficiencies reported by this inspection.

B. The Testing Laboratory selected shall meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, as published by the American Council of Independent Laboratories.

C. Testing machines shall be calibrated at interval not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standard or accepted values of natural physical constants. The Testing Laboratory shall submit a copy of certificate of calibration made by an accredited calibration agency.

D. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society of Testing and Materials or other recognized and accepted authorities in the field.

1.4 AUTHORITIES AND DUTIES OF THE LABORATORY

A. Attending Preconstruction Conferences: The Testing Laboratory shall obtain and review the project plans and specifications with the Architect and Engineer as soon as possible prior to the start of construction. The Laboratory shall attend preconstruction conferences with the Architect, Engineer, Project Manager, General Contractor, and materials suppliers as required to coordinate materials inspection and testing requirements with the planned construction schedule. The Laboratory will participate in such conferences throughout the course of the project.

B. Outline Testing Program: The Testing Laboratory shall be responsible for outlining a

written detailed testing program conforming to the requirements as specified in the Contract Documents and in consultation with the Contractor, Owner, Architect, and Engineer. The testing program shall contain an outline of inspections and tests to be performed with references to applicable section of the specifications or drawings and a list of personnel assigned to each portion of the work. Such testing program shall be submitted to the Contractor, Owner, Architect, and Engineer five weeks in advance of the start of construction so as not to delay the start of construction. It shall be the Testing be the Testing Laboratory's responsibility that such program conforms to the requirements of the Specifications and Drawings and falls within the budget for testing laboratory services. If the allocated budget is not sufficient to cover their services as outlined in the Specifications, it shall be the responsibility of the Laboratory to notify the Contractor, Architect, Engineer, and Owner so that the Laboratory services can be modified accordingly prior to the start of construction. Furthermore, the Testing Laboratory shall monitor its expenditures throughout the course of the job and notify immediately the Contractor, Owner, Architect, and Engineer, of any significant deviation from the planned testing program and budget.

C. Cost Proposal: The Testing Laboratory's proposal to the Contractor shall contain the outlined testing program based on a unit price basis for tests and inspections and on a hourly basis for personnel. A total estimated price shall also be submitted.

D. Cooperation with Design Team: The Laboratory shall cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.

E. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.

F. Inspections Required by Government Agencies: The Testing Laboratory shall perform all inspections and summit all reports and certifications as required by all government agencies.

G. Notification of Deficiencies in the Work: The Laboratory shall notify the Architect, Engineer, and Contractor first by telephone and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.

H. Reports:
   1. Information on Reports: The laboratory shall submit copies of all reports of inspections and tests promptly and directly to the parties named below. All reports shall contain at least the following information:
      a. Project Name
      b. Date report issued
      c. Testing Laboratory name and address
      d. Name and signature of inspector
      e. Date of inspection and sampling
      f. Date of test
      g. Identification of product and Specification section
      h. Location on the project
      i. Identification of inspection or test
      j. Record of weather conditions and temperature (if applicable)
      k. Results of test regarding compliance with Contract Documents.
   2. Copies: The Laboratory shall send certified copies of test and inspection reports to the following parties:
      a. 2 copies to the Owner or his representative

b. 2 copies to the general Contractor
c. 1 copy to the Architect
d. 1 copy to the Engineer of responsibility
e. 1 copy to the supplier of the material tested
f. 1 copy to the Mechanical Engineer

I. Accounting: The Testing Laboratory shall be paid as per section 1.2 Procedure.

J. Obtaining Product and Material Certifications: The Testing Laboratory shall be responsible for obtaining all product and material certifications from manufacturers and suppliers as specified in the Specifications.

K. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

1.5 CONTRACTOR'S RESPONSIBILITY

A. Cooperation with Design Team: The Contractor shall cooperate with laboratory personnel, provide access to the work, and to manufacturers operations.

B. Furnishing Samples: The Contractor shall provide to the laboratory representative, samples of materials proposed for use in the work in qualities sufficient for accurate testing as specified.

C. Finishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate all required inspections and tests.

D. Advance Notice: The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

E. Payment for Substitution Testing: The Contractor shall arrange with the Testing Laboratory and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.

F. Payment for Re-testing: The Contractor shall pay for any additional inspections, sampling, testing, and re-testing as required when initial tests indicate work does not comply with the requirements of the Contract Documents.

G. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and Testing Laboratory when the source of any material is changed after the original tests or inspections have been made.

H. Tests for Suspected Deficient Work: If in the opinion of the Owner, Architect, or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect or the Engineer deem advisable to determine its proper construction.

I. Costs incurred in the above section "1.5 contractor's responsibility" shall not be part of the allowance as per section "1.2 procedure" and shall be the responsibility of the General Contractor.

1.6 PAYMENT OF TESTING LABORATORY

A. The Contractor will pay for all Laboratory services (re: section 1.2 procedure) for testing materials for compliance with the requirements of the contract documents. The Contractor will also pay for testing and re-testing of materials that do not comply with the requirements of the Contract Documents and all other items as specified in these Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SCOPE OF WORK

A. The work to be performed be the Testing Laboratory shall be as specified in this Section of the Specifications and the contract drawings, and as determined in meetings with the Contractor, Owner, Architect, and Engineer.

3.2 EARTHWORK

A. Foundation:
   1. Field inspection of piers and pier steel prior to pouring concrete (if piers are used).
   2. Field inspection of slab, grade beams, and steel prior to concrete pouring.

3.3 CONCRETE MATERIALS AND POURED PLACE CONCRETE

A. Concrete Mix Designs: The contractor shall submit for approval by the Engineer and Testing Laboratory at least 15 days prior to the start of construction, concrete mix designs for each class of concrete indicated on the structural drawings and in the specifications. The Contractor shall not begin work until the applicable mix design has been approved.
   1. The Contractor acting in conjunction with his Concrete Supplier and the Testing Laboratory shall submit in writing with his mix designs, whether the concrete is to be proportioned by either of the following methods as outlined in ACI 318:
      a. Field Experience Method
      b. Laboratory Trail Batch Method
         When field experience methods are used to select concrete proportions, established proportions as specified in ACI 301 and ACI 211. When Laboratory trail batches are used to select concrete proportions, the procedure as outlined in ACI 318 shall be followed. Prepared test specimens in accordance with ASTM C192 and conduct strength tests in accordance with ASTM C39.
   2. Required types of concrete and compressive strengths shall be as indicated on the Structural Drawing and as specified in the various sections of the Specifications.
   3. All mix designs shall state the following information:
      a. Mix design number or code designation by which the Contractor shall order the concrete from the Supplier
      b. Structural member for which the concrete is designed (i.e. columns, shear walls, footings, etc.)
      c. Type of concrete whether normal weight or lightweight
      d. 28 day compressive strength
      e. Aggregate type, source, size, gradation, fineness modules
      f. Cement type and brand

g. Fly ash type and brand (if any)
h. Admixtures including air entrainment, water reducers, accelerators, and retarders.
i. Slump
j. Proportions of each material used
k. Water cement ratio and maximum allowable water content
l. Method by which the concrete is intended to be placed (bucket, chute, or pump)

4. Concrete Suppliers Record of Quality Control: The concrete supplier's past record of quality control shall be used in the design of the concrete mixes to determine the amount by which the average concrete strength Fcr should exceed the specified strength f'c as outlined in ACI 318. If a suitable record of test result is not available, the average strength must exceed the design strength by 1200 PSI as specified in ACI 318. After sufficient data becomes available from the job, the statistical methods of ACI 214 may be used to reduced the amount by which the average strength must exceed f'c as outlined in ACI 318.
5. Admixtures:
   a. Admixtures to be used in concrete shall be subject to the approval of the Engineer and Testing Laboratory.
   b. Quantities of admixtures to be used shall be in strict accordance with the manufacturers instructions.
   c. Admixtures containing chlorine ions shall not be used in prestressed concrete, in concrete containing galvanized or aluminum embedments, or in metal deck floors or roofs.
   d. Air entraining admixtures shall conform to "Specification for Air Entraining Admixtures for Concrete" ASTM C260.
   e. Water reducing admixtures, retarding admixtures accelerating admixtures, water reducing and retarding admixtures, and water reducing and accelerating admixtures shall conform to "Specification for Chemical Admixtures for Concrete" ASTM C494
   f. Fly ash or other pozzolons, used as admixtures, shall conform to "Specification for Fly Ash and Raw or Calcined Natural Pozzolons for use in Portland Cement Concrete" ASTM C618. Obtain mill test reports for approval. Maximum fly ash content shall be 20%.
   g. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities of admixtures as required to maintain quality control.
6. Slump Limits: Unless shown otherwise on the structural drawings, proportion and design mixes to result in concrete slump at the point of placement as follows:
   a. Ramps and Sloping surfaces - 3" +/- 1"
   b. Foundation concrete -4-1/2" +/- 1-1/2"
   c. All other concrete -4" +/- 1"

   When increase workability, pumpability, lower water-cement ratio, shrinkage reduction, or permeability reduction is required, then a superplasticizer admixture shall be considered for use. The maximum slump with the use of superplasticizers shall be 8 inches unless approved otherwise by the Architect/Engineer and Testing Laboratory.

   Any deviation from these values (such as concrete design to be pumped) shall be submitted to the Engineer and Testing Laboratory for approval.
7. Adjustments of Concrete Mixes: Mix design adjustments may be requested by the

contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Such mix design adjustments shall be provided at no additional cost to the Owner. Any adjustments in approved mix designs including changes in admixtures shall be submitted in writing to the Engineer and Testing Laboratory for approval prior to field use.

8. Shrinkage: All concrete shall be proportioned for a maximum allowance unit shrinkage of 0.03% at 28 days as determined by ASTM C 157.
9. Chloride Ion Content: A written submittal shall be made with each design proposed for use on the project that the chloride ion content from all ingredients including admixtures will not exceed the limits specified in the Cast-In-Place section of the Specifications.

B. Concrete Test Cylinders by the Testing Laboratory:
   1. Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C31 "Method of making and Curing Concrete Test Cylinders in the Field" and tested in accordance with ASTM C39 "Method of Testing for Compressive Strength of Cylindrical Concrete Specimens".
   2. Field Samples: Field samples for strength test shall be taken in accordance with ASTM C172 "Method of Sampling Fresh Concrete".
   3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according the following frequency guidelines:
      a. One set for each class of concrete taken not less than once a day.
      b. Piers: One set for each 50 cubic yards or fraction thereof.
      c. Underreamed Footings: One set for each 50 cubic yards or fraction thereof.
      d. Walls: One set for each 150 cubic yards.
      e. Spread Footings: One set for each 50 cubic yards or fraction thereof.
      f. Floors: One set for each 150 cubic yards or fraction thereof but not less than one set for each 5000 square foot of floor area.
      g. Columns: one set for each 50 cubic yards or fraction thereof with a minimum of 2 sets per floor.
      h. All other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof.
      i. No more than one set of cylinders at a time shall be made from any single truck.
      j. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
      k. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.

         The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded. Of the four cylinders per set break one at seven days, two at 28 days, and one automatically at 56 days only if either 28 day cylinder break is below required strength.
   4. Cylinders Storage Box: The Contractor shall be responsible for providing a protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory.
   5. Transporting Cylinders: The Testing Laboratory shall be responsible for

transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders.

6. Information on Concrete Test Reports: The Testing Laboratory shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:
   a. Truck number and ticket number
   b. Concrete Batch Plant
   c. Mix design number
   d. Accurate location of pour in the structure
   e. Strength requirement
   f. Date cylinders made and broken
   g. Technician making cylinders
   h. Concrete temperature at placing
   i. Air temperature at point of placement in the structure.
   j. Amount of water added to the truck at the batch plant and at the site and weather it exceeds the amount allowed by the mix design.
   k. Slump
   l. Unit weight
   m. Air weight
   n. Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven day breaks are to be flagged if they are less than 60% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.

C. Other Required Tests of Concrete by the Testing Laboratory (unless noted otherwise)
   1. Slump Tests: Slump Tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders made.
   2. Air Entrainment: Air Entrainment (ASTM C233) tests shall be made at the same time slump tests are made as cited above.
   3. Concrete Temperature: Concrete temperature at placement shall be measured at the same time slump tests are made as cited above.
   4. Chloride Ions: The Contractor shall have the laboratory verify in a written submittal with the mix designs that the chloride ion concentration will not exceed the limits specified. Tests shall be run for each class of concrete according to AASHTO Designation T 260-82 Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials to determine that the maximum chloride ion content does not exceed the limits stated in the concrete section of the specifications. One test shall be run for each set of cylinders specified to be taken for each class of concrete.

D. Evaluation and Acceptance of Concrete:
   1. Strength Test: A strength test shall be defined as the average strength of two 28 day cylinder breaks from each set of cylinders.
   2. Acceptance Criteria: The strength level of and individual class of concrete shall be considered satisfactory if both of the following requirements are met:
      a. The average of all sets of three consecutive strength tests equal or exceed the required f'c.
      b. No individual strength test (average of two 28 day cylinder breaks) falls below the required f'c by more than 500 PSI.

      If either the above of the requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be

taken to increase the average of subsequent strength tests.

E. Investigation of Low Strength Concrete Test Results:
   1. Contractor Responsibility for Low Strength Concrete:
      If any strength test of Laboratory cured cylinders falls below the required f'c by more than 500 psi, the Contractor shall take steps immediately to assure that the load carrying capacity of the structure is not jeopardized.
   2. Nondestructive Field Tests: The Testing Laboratory shall under the direction of the Engineer perform nondestructive field tests of the concrete in question using Swiss Hammer, Windsor Probe, or other appropriate methods as approved by the Engineer and report the results in the same manner as for cylinder test reports.
   3. Core Tests: If the likelihood of low strength concrete is confirmed and computations indicate that the load carrying capacity of the structure has been significantly reduced, tests of cores by the Testing Laboratory, drilled from the area in question under the direction of the Engineer, will be required in accordance with ASTM C42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete". In such case, three cores shall be taken for each strength test more than 500 psi below required f'c. If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60 degrees to 80 degrees Fahrenheit, relative humidity less than 60 percent) for 7 days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 48 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved drypack concrete.
   4. Acceptance Criteria for Core Tests: Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85% of f'c and if no single core is less than 75% of f'c. If approved by the Engineer, locations of erratic core strengths may be retested to check testing accuracy.
   5. Load Test: If the above criteria are not met and the structural adequacy remains in doubt, the Engineer may order a load test as specified in ACI 318 for the questionable portion of the structure.
   6. Strengthening of the Structure or Demolition: If the structural adequacy of the affected portion of structure remains in doubt, the Engineer may order the structure to be strengthened by an appropriate means or demolished and rebuilt.
   7. Cost of Investigations for Low Strength Concrete: The cost of all investigations of low strength concrete shall be borne by the Contractor.

F. Job Site Inspection: The scope of the work to be performed by the inspector on the jobsite shall be as follows:
   1. Verify that air temperatures at the point of placement in the structure are within acceptable limits defined above prior to ordering of concrete by the Contractor.
   2. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
   3. Inspect plastic concrete upon arrival at the job site to verify proper batching. Observe mix consistency and adding water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

4. Obtain concrete test cylinders.
5. Perform slump test and air entrainment tests.
6. Record information for concrete test reports.
7. Verify that all concrete being placed meets job Specifications. Report concrete not meeting the specified requirements and immediately notify the Contractor, Batch Plant Inspector, Contractor, Architect, Engineer, and Owner.
8. Pick up and transport to Laboratory, cylinders cast the previous day.
9. Check concrete placing techniques to determine that concrete deposited is uniform and that vertical drop does not exceed six feet.
10. The job site inspector shall report an irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.

G. Causes for Rejection of Concrete: The Contractor shall reject all concrete delivered to the site for any of the following reasons:
   1. Wrong class of concrete (incorrect mix design number).
   2. Air temperature: Air temperature limits shall be as follows:
      A. Cold Weather: Air temperature must be 40 degrees Fahrenheit and raising.
      B. Hot Weather: Air temperature must be cooler than 100 degrees.
      Concrete may be placed at other air temperature ranges only with approval of the job inspector for the Testing Laboratory or other duly appointed representative.
   3. Concrete with temperatures exceeding 95 degrees Fahrenheit may not be placed in the structure.
   4. Air contents outside the limits specified in the mix designs.
   5. Slumps outside the limits specified in the mix designs.
   6. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory job inspector or other duly appointed representative.
      The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

H. Concrete Batch Trip Tickets: All concrete batch tickets shall be collected and retained be the Contractor. Comprehensive strength, slump, air, and temperature test shall be identified by reference to a particular trip ticket. All ticket shall contain the information specified in ASTM C 94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Contractor and Testing Laboratory shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 70 00 PROJECT CLOSEOUT

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures
   2. Record Drawings
   3. Record Specifications
   4. Record Product Data
   5. Final Cleaning

B. All closeout documents shall be also provided in PDF, CAD, or BIM format on a USB flash drive.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. In the Application for Payment that coincides with the date Substantial Complete is claimed, show 100 percent completion for the portion of the work claimed substantially complete.
   4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
   5. Obtain and submit releases permitting Owner unrestricted use of Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
   6. Submit record drawings, operation and maintenance manuals, final completion project photographs, damage or settlement survey, property survey, and similar record information.
   7. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer’s name and model number where applicable.
   8. Change-over permanent locks and transmit keys to the Owner.
   9. Completion start-up testing of systems, and instruction of the Owner's personnel.
   10. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
   11. Complete final clean-up, including touch-up painting. Touch-up and repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will proceed or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the Certificate will be issued.
   1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 FINAL ACCEPTANCE

A. Before requesting inspection for certification of final acceptance and final payment, complete the following:
   1. Submit the final payment request with releases.
   2. Submit a final statement, accounting for changes to the Contract Sum.
   3. Submit an officially notarized copy of the Architect's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect.
   4. Submit final meter readings for utilities, a record of stored fuel, and similar data as of Substantial Completion.
   5. Submit consent of surety to final payment.
   6. Submit evidence of continuing insurance coverage complying with insurance requirements.
   7. Submit pest-control final inspection report and warranty

B. Inspection: Submit a written request for final inspection for acceptance. 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 Contractors of construction that must be completed or corrected before certificate will be issued.

C. Re-inspection Procedure: The Architect will reinspect the Work upon receipt of the contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for those items whose completion has been delayed because of circumstances that are acceptable to the Architect.
   1. Upon completion of reinspection, the Architect will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
   2. If necessary, the reinspection procedure will be repeated.

PART 2 PRODUCTS

2.1 RECORD DOCUMENT SUBMITTAL

A. Do not use Record Documents for construction purposes; protect from loss in a secure location; provide access to Record Documents for the Architect's reference.
B. Provide 2 sets of Closeout Binders
C. Provide 2 sets of As-Built Record Drawing Prints.
D. Provide 1 digital copy of all closing documents and As-Built documents in PDF, CAD and BIM format on a USB flash drive and a hard copy of all documents.
E. Provide product warranties.
F. Provide standard warranty request
G. Provide list of ‘Attic Stock’ delivered to Owner.
H. Provide Consent of Surety documents.
I. Commissioning report(s) as applicable.
J. Provide list of subcontractors used in project
K. Provide color selection list of all products used in project.

L. Manufacturer product operation manuals
M. Contractor shall coordinate building systems training with owner and create a working video of training.

2.2 RECORD DRAWINGS

A. Maintain a clean, undamaged set of prints of Contract Drawings and Shop Drawings.
    1. Mark-up these drawings to show the actual installation. Mark whichever drawing is most capable of showing conditions accurately.
        a. Give particular attention to concealed elements that would be difficult to measure at a later date.
        b. Organize record sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover.
        c. Accurately record information in an understandable drawing technique.
        d. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    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 foundation 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 or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
    4. Mark important additional information that was either shown schematically or omitted from original Drawings.
    5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.3 RECORD SPECIFICATIONS

A. Maintain one copy of the Project Manual, including addenda. Mark to show variations in actual Work performed in comparison with the Specifications and modifications.
    1. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot be readily discerned later by direct observation.
    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 record drawing information and Product Data.

B. Upon completion of the Work, submit record Specifications to the Architect for the owner's record.

2.4 MAINTENANCE MANUALS

A. Organize maintenance data into sets of manageable size. Bind in individual heavy-duty ring vinyl-covered binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information:
   1. Emergency instructions.
   2. Spare parts list.
   3. Copies of warranties.
   4. Wiring diagrams.
   5. Recommended "turn around" cycles.
   6. Inspection procedures.
   7. Shop Drawings and Product Data.
   8. Fixture lamping schedule.

2.5 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Arrange for the installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Include a detailed review of the following:
   1. Maintenance manuals.
   2. Spare parts and materials.
   3. Tools.
   4. Lubricants.
   5. Control sequences.
   6. Hazards.
   7. Warranties and Bonds.
   8. Standard warranty request repair form
   9. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:
   1. Start-up and shut-down.
   2. Emergency operations.
   3. Noise and vibration adjustments.
   4. Safety procedures.

N. Contractor coordinate building systems training with owner and create video of training.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Employ experienced workers for final cleaning. Clean each surface to the condition expected in a commercial building cleaning maintenance program.

O. 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.

1. Complete the following before inspection for certification of Substantial Completion:
    a. Remove labels that are not permanent labels.
    b. Clean transparent materials. Remove glazing compound. Replace chipped or broken glass.
    c. Clean exposed hard-surface finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
    d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
    e. Clean the site of rubbish, litter and other foreign substances. Sweep paved areas; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
    f. Clean surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    g. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers and grills.
    h. Clean ducts, blowers and coils if units were operated without filters during construction.
    i. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeable dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirement for new fixtures.
    j. Leave Project clean and ready for occupancy.

3.2 PEST CONTROL

A. Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

3.3 REMOVAL OF PROTECTION

A. Remove temporary protection and facilities.

3.4 COMPLIANCE

A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials from the site and dispose of in a lawful manner.

END OF SECTION

DIVISION 1 GENERAL REQUIREMENTS
01 78 36 WARRANTIES AND BONDS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Warranties
   2. Bonds

B. Standard Products Warranties are reprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

C. Special Warranties are written warranties required by or incorporated in Contract Documents, to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS

2.1 WARRANTY DOCUMENTS

A. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3 ring, vinyl covered, loose leaf binders, thickness as necessary to accommodate contents. Provide typed tabs for each separate item.
   2. Copies of each warranty to be included in the Operation and Maintenance Manuals.

PART 3 EXECUTION

3.1 DISCLAIMERS AND LIMITATIONS:

A. Manufacturer's disclaimers and limitation on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractor required to countersign warranties with the Contractor.

3.2 RELATED DAMAGES AND LOSSES:

A. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

3.3 REINSTATEMENT OF WARRANTY:

A. When Work covered by a warranty has failed and been corrected, reinstate the warranty by written endorsement. The reinstated warranty shall be equal with an equitable adjustment for depreciation.

3.4 REPLACEMENT COSTS:

A. On determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from the use of the Work through part of its useful service life.

B. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties on the Architect's request.

3.5 CONTRACTOR'S GUARANTEE:

A. The Contractor does hereby guarantee all equipment, apparatus and parts against defects in design workmanship, or material where not otherwise specified for a period of not less than **(2) TWO** years after completion of Contract. Any parts found to be defective shall be replaced at the Contractor's expense. In the event that one or more of the defects mentioned above shall appear within the specified period, the Owner shall have the right to continue to use or operate the defective part of the apparatus until the Contractor is able to make repairs or replacements, or until such time as it can be taken out of service without loss or inconvenience to the Owner. In case of defective minor parts, the Owner may, at his own expense, do the work of installing replaced defective parts, provided he finds it is to his interest to do so.

1. Refer to mechanical drawings and specifications for warranties on compressors and mechanical equipment that might be different from above.

3.6 MANUFACTURERS GUARANTEE: 20 years N.D.L. for roofs, typical. **N/A**

END OF SECTION

DIVISION 2 SITE WORK
02 15 00 SHORING AND BRACING

PART 1 GENERAL

1.1 GENERAL DESCRIPTION OF WORK

A. Building excavation is specified in another Division-2 section.

B. Engage and assign supervision of shoring and bracing work to a qualified consultant.

C. All work must be done in accordance with these specifications and comply with local codes and ordinances of governing authorities having jurisdiction.

1.2 JOB CONDITIONS

A. Before starting work, check and verify governing dimensions and elevations. Survey condition of adjoining properties, take photographs, recording existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verify by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey of adjacent structures and improvements, establishing exact elevations at fixed points at act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by movement resulting from excavation operations, etc.

C. During construction re-survey benchmarks weekly, employing licensed Land Surveyor or registered Professional Engineer, licensed in State of Project. Maintain accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags or other damage is evident.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide suitable shoring and bracing materials which will support loads imposed

PART 3 EXECUTION

3.1 EXISTING UTILITIES

A. Protect existing active utility services and structures from damage during shoring and bracing work. Repair or replace damages to satisfaction of utility Owner.

3.2 SHORING

A. Protect site from caving and unacceptable soil movement. Where shoring is required, locate system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures

B. Shoring systems retaining earth on which support or stability of existing structures is dependent must be left in place at completion of work. If wood is part of shoring system near existing structures, use pressure preservative treated materials or remove before placement of backfill.

3.3 BRACING

A. Locate bracing to clear columns, floor framing constructions, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place where it will be cast into or include in permanent concrete work, except as otherwise acceptable to Architect.

C. Install internal bracing, if required, to prevent spreading or distortion to braced frames.

D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic and roof design loads.

E. Remove sheeting, shoring and bracing in stages to avoid disturbances to underlaying soils and damage to structures, pavements, facilities utilities, etc.

F. Repair or replace adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION

DIVISION 2 SITE WORK
02 41 00 SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Extent: Extent of selective demolition work is indicated on drawings.

B. Types of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:
   1. Entire Building and or portions of buildings structure indicate on drawings and as required to accommodate new construction.
   2. Shutoff, capping, and continuation of utility services as required, together with details for dust and noise control.

1.2 PROJECT CONDITIONS

A. Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition.
   1. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations.
   2. Provide minimum of 72 hours advance notice to Owner of demolition activities which will impact Owner's normal operation.

B. Owner assumes no responsibility for buildings and structures to be demolished.
   1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
   2. Before building demolition, Owner will remove items they will retain prior to demolition beginning.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If material suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.3 COORDINATION

A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CONDITION OF STRUCTURES:

A. Owner assumes no responsibility for actual condition of item or structures to be demolished.

3.2 PROTECTION:

A. Provide temporary barricades another forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

B. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

C. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks of required.

D. Remove protection at completions of work.

3.3 DAMAGES:

A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

3.5 TRAFFIC:

A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

3.6 UTILITY SERVICES:

A. Maintain existing utilities indicated remain, keep in service, and protect against damage demolition operations.

3.7 INSPECTION:

A. Prior to commencement of selective demolition work, inspection areas win which work is to be performed.

B. Photograph existing condition to structure surfaces, equipment or to properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to stating work.

3.8 PREPARATION:

A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse to be demolished and adjacent facilities to remain.

B. Cease operation and notify Owner's Representative immediately if safety of structure appears to be endangered.
   1. Take precautions to support until determination is made for continuing operations.

C. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

D. Provide weatherproof closures for exterior openings resulting from demolition work.

E. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building.
    1. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.9 DEMOLITION:

A. Perform selective demolition work in a systematic manner.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driving masonry saw or hand tools; do not use power-driven impact tools.

C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting wall, floors or framing.

D. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

E. Demolish foundation walls to a depth of not less than 12" below existing ground surface.
    1. Demolish and remove below-grade wood or metal construction.
    2. Breakup below-grade concrete slabs.

F. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

G. Completely fill below-grade areas and voids resulting form demolitions work.
    1. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.

H. If unanticipated mechanical, electrical or structural elements which conflict with function or design are encountered, investigate and measure both nature and extent of conflict.
    1. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.10 SALVAGE ITEMS:

A. Where indicated on Drawings as "Salvage-Deliver to Owner," carefully remove indicated items, clean, store and turn to Owner and obtain receipt.

3.11 DISPOSAL OF DEMOLITION MATERIALS:

A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.
    1. Burning of removed materials is not permitted on project site.

3.12 CLEAN-UP AND REPAIR:

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protection and leave interior areas broom clean.

B. Repair demolition performed in excess of that required.
   1. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work.
   2. Repair adjacent construction or surfaces soiled damages by selective demolition work.

C. Protect existing trees and vegetation to remain from physical damage. Do not store materials or equipment within tree drip line.

END OF SECTION

DIVISION 4 MASONRY
04 20 00 UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMUs).
   2. Building (common) brick. N/A
   4. Mortar and Grout
   5. Embedded flashings
   6. Dampproofing

B. See Division 05 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.

C. See Division 07 Section "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.2 SUBMITTALS

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

B. Shop Drawings: For 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.

C. Samples for each type and color of exposed masonry units and colored mortars.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
   1. For masonry units include material test reports substantiating compliance with requirements.
   2. Submit certification of moisture content, fire resistive rating(s) or compressive strengths(s).

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

A. Comply with recommendations of Brick Institute of America (BIA), and National Concrete Masonry Assoc. (NCMA). Contractor should get Architect's approval before ordering.

B. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.
   1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
   2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
   3. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
   4. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

D. MOCK WALL: Build mock wall to verify selections made under sample submittals and to demonstrate aesthetic effects. Provide 8’ long by 4’ high mock wall. Sample shall be located away from building and be left for the duration of the construction. Mock wall shall be composite of the entire typical wall thickness. Construct conditions showing sill, head, jamb, and terminations with other materials.

1.4 PROJECT CONDITIONS

A. 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.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified or approved equal.

2.2 COLORS, TEXTURES, AND PATTERNS

A. Exposed Masonry Units: As indicated by manufacturer's designations.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions for applications where forms, size or finish cannot be produced from standard shapes.

B. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength for exposed units.
   1. Products:
      a. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
      b. or approved equal.

C. Concrete Masonry Units: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
   2. Weight Classification: Normal weight.
   3. Pattern and Texture for Decorative Units: (at mechanical yards) **N/A**
      a. 12” x 12” Standard square pattern, ground finish.
      b. Non-ground, standard as-cast finish.
   4. Pre-faced Concrete Masonry Units: Lightweight concrete units, with smooth resinous facing complying with ASTM C 744.
      a. Size: Manufactured with pre-faced surfaces having 1/16-inch- wide returns of facing to create 1/4-inch- wide mortar joints.

D. Provide Bullnose CMU at:
   1. All corners
   2. All door and window jambs, sills and headers

E. Provide Grade N load bearing units complying with the following requirements: 4” – at column furring and chases, 6" CMU – at interior walls, 8” load bearing. (Refer to structural and architectural plans for location and sizes)
   1. TYPE: I HOLLOW BLOCK: ASTM C 90. SOLID BLOCK: ASTM C 145. (where indicated)
   2. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
   3. Hollow Block: ASTM C 90; SOLID BLOCK: ASTM C 145
   4. Color / Texture: Submit samples from full range of manufacturers color samples.

2.4 BRICK **– N/A**

A. General: Provide shapes indicated and as follows:
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished. Provide mitered joints at all outside corners.
   2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: ASTM C 216, Grade SW, Type FBS specifications. Provide bricks as listed below:
   1. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   2. Size - Commercial Emperor Size (3-9/16” h x 3-9/16 w x 15-9/16” l)
   3. Manufacturers: 1. Interstate Brick Company
      2. or approved equal
   4. Color and Texture: 16” Emperor – Mountain Red. Verify to match existing brick on existing building.

C. Request for substitutions must be approved by architect minimum of 7 days prior to bid date. Refer to Section 01010, Items 1.18 and 1.29 for substitution guidelines.

2.5 CONCRETE AND MASONRY LINTELS

A. Concrete Lintels: Precast units matching concrete masonry units and with reinforcing bars indicated or required to support loads indicated.

B. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

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

C. Mortar Pigments: Iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Products:
      a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
      b. Davis Colors; True Tone Mortar Colors.
      c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

D. Aggregate for Mortar: ASTM C 144.
   1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Aggregate for Grout: ASTM C 404.

F. 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:
      a. Addiment Incorporated; Mortar Kick.
      b. Euclid Chemical Company (The); Accelguard 80.
      c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
      d. Sonneborn, Div. of ChemRex; Trimix-NCA.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
   1. Products:
      a. Addiment Incorporated; Mortar Tite.
      b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
      c. Master Builders, Inc.; Rheomix Rheopel.
      d. Krete by Krete Industries

H. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
B. Masonry Joint Reinforcement: ASTM A 951; hot-dip galvanized, carbon-steel wire for exterior walls. **Start first row of ties at 8” above finish floor.**
   1. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
   2. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
   3. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
   4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   5. Single-Wythe Masonry: Truss type with single pair of side rods.
   6. Double-Wythe Masonry: Truss type eye and pintle
   7. Refer to drawings for more information.

2.8 TIES AND ANCHORS

A. Joint Reinforcement, Ties and Anchoring Devices: Comply with requirements indicated below for basic materials and with those indicated under each item.

B. Hot Dip Galvanized Wire: ASTM A 82 for uncoated wire, ASTM A 123 for zinc coating applied after prefabrication.
   1. Wire: Fabricate from 1/4-inch- diameter, hot-dip galvanized steel wire.

C. Joint Reinforcement: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10' and of widths to fit wall thickness indicated, with prefabricated corner and tee units, and as follows:
   1. Wire size for side and cross rods: 0.1483" diameter.

D. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer. Ties must extend to within 1” of face of brick.

F. Adjustable Anchors for Connecting to Structure: 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.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch- diameter, hot-dip galvanized steel wire.
   3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.097-inch- thick, steel sheet, galvanized after fabrication.

G. Partition Top anchors: 0.097-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.

H. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

I. Adjustable Masonry-Veneer Anchors
   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing**,** where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim."
   1. Metal Drip Edges: 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.
   2. Metal Flashing Terminations: 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 3/8 inch to form a stop for retaining sealant backer rod.
   3. Metal Expansion-Joint Strips: Fabricate from stainless steel or copper to shapes indicated.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Weeps to be seated directly on the flashing below **and not on the mortar bed joint.** Use one of the following, unless otherwise indicated:
   1. Rectangular Plastic Weep/Vent: Clear butyrate, 3/8” X full head height and depth of joint.
   2. 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:
         1) Advanced Building Products Inc.; Mortar Maze weep vent.
         2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
         3) Heckmann Building Products Inc.; No. 85 Cell Vent.
         4) Hohmann & Barnard, Inc.; Quadro-Vent.
         5) Wire-Bond; Cell Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Provide one of the following configurations:
      a. Strips, full-depth of cavity and 10 inches wide, trapezoidal type system with dovetail shaped notches 7 inches deep.
   2. Products:
      a. Advanced Building Products Inc.; Mortar Break.
      b. Archovations, Inc.; CavClear Masonry Mat.
      c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
      d. Mortar Net USA, Ltd.; Mortar Net.

2.11 INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin. Refer to drawings for more application

B. Injected Foam Insulation: Refer to drawings for more information

2.12 MASONRY CLEANERS

A. ALWAYS TEST a small area of each surface to confirm suitability and desired results before starting overall application. Test with the same equipment, recommended surface preparation and application procedures planned for general application.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   1. Manufacturers:
      a. ProSoCo, Inc.
      b. Diedrich Technologies, Inc.
      c. EaCo Chem, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
   3. 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. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
   1. For masonry below grade or in contact with earth, use Type M.
   2. For reinforced masonry, use Type S.
   3. For mortar parge coats, use Type S or N.
   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.

C. 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.

D. Grout for Unit Masonry: Comply with ASTM C 476. Non-Shrink
   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. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform water test in the cavity once the masonry veneer is at least 16” above the lug or ledge. This is to visually observe if the weeps are open or clogged with debris. This can be an informal test, does not have to be ASTM test, just do not flood the cavity.

B. Use full-size units without cutting if possible. If cutting is required, 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. Do not install chipped or broken units.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

D. 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.

E. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
   1. 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.
   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.

3.2 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. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

E. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

F. Provide slip sheet beneath lintels at bearing points on the brick at the jamb conditions.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units 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.
   5. Lay brick in full bed of mortar, only. Furrowing is not allowed for clay masonry units.
   6. Do not temper mortar on the mortar board more than once.

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

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

3.4 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:
   1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
   1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.5 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
   1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
      c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit insulation between wall ties and other confining obstructions, with edges butted tightly. Press units firmly against inside wythe of masonry.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install 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.

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.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated.
   2. Anchor masonry to structural members 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.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners.
   2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 8” and not to exceed 16” of openings and at intervals, not exceeding 36 inches, around perimeter.
   5. Anchor fasteners to be sealed with mastic, wall shall be inspected by Architect or their representative to ensure all holes are sealed prior to installing veneer.

3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: 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.

B. Install flashing as follows, unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
   2. At lintels and shelf angles, extend flashing a minimum of 8 inches (10” if king size) into masonry at each end. At heads and sills, Provide end dams at the ends of flashing.
   3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
   4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent products or open head joints to form weep holes.
   2. Space weep holes 24 inches o.c., unless otherwise indicated, or a minimum of 2 each over each opening.
   3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material.

E. Install vents in open head joints in exterior wythes at spacing indicated. Use specified weep/vent products or open head joints to form vents. Set weeps on top of flashing below. Do not set on mortar bed.
   1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.10 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 temporary 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 60 inches.

3.11 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

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

G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, in 2 uniform coats to a total thickness of 3/4 inch with a steel-trowel finish. Form a wash at top of parging and a cove at bottom. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
   2. Protect adjacent surfaces from contact with cleaner.
   3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
   5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
   6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

A. 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. Do not dispose of masonry waste as fill within 18 inches of finished grade.
   2. 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

DIVISION 5 METALS
05 58 00 MISCELLANEOUS SHEET METALS

PART 1 GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS: In addition to product data, submit the following:
   1. Shop drawings showing details of fabrication, assembly, and installation.
   2. Samples, submit 8" square samples of each metal and finish required.

PART 2 PRODUCTS

2.1 MATERIALS/FABRICATION

A. MANUFACTURER: Subject to compliance with requirements, provide miscellaneous sheet metal products by one of the following:
   1. American Steel Products Corp.
   2. Bergen Metal Industries, Inc.
   3. Brandt Airflex Corp.
   4. Custom Enclosures, Inc.
   5. Pioneer Ind. Div., Core Ind. Inc.

B. SHEET METAL MATERIALS: Use materials selected for their surface flatness, smoothness, and freedom from surface blemishes.

C. GALVANIZED SHEET STEEL: ASTM A 526, G90, mill phosphatized.

D. SHEET STEEL: Commercial quality cold-rolled carbon steel as follows:
   1. ZINC-COATED SHEET STEEL: ASTM A 591, Class C, chemically treated with phosphate solution and light chromate rinse.
   2. SHEET STEEL: ASTM A 366, Class 1, matte finish.

E. WELDING ELECTRODES AND FILLER METAL: Type and alloy to match metal to be welded.

F. FASTENERS: Concealed, except as otherwise indicated, of type and alloy to match metal to be fastened; use Phillips flat-head screws for exposed fasteners where permitted, unless otherwise indicated.

G. ANCHORS AND INSERTS: Furnish as required for installation in other work. Use cadmium or hot-dipped galvanized units for exterior work.

H. SHOP PRIMER FOR SHEET STEEL: Manufacturer's standard fast-curing, lead-free, "universal" primer; complying with performance requirements of FS TT-P-645.

I. SHOP PRIMER FOR ZINC-COATED SHEET STEEL: Zinc dust, zinc oxide primer paint complying with FS TT-P-641, Type II.

J. SHOP PRIMER FOR ALUMINUM SHEET: Zinc chromate base complying with FS TT-P-645 or TT-P-1757.

K. BAKED ENAMEL FINISH: Alkyde gloss enamel; FS TT-P-489, Class B.

PART 3 EXECUTION

3.1 FABRICATION

A. GENERAL: Fabricate items from materials of type, gauge and finish and to dimensions and details indicated, or required to provide unit of strength required for intended use and to produce exposed surface which are smooth, flat and free of imperfections.

B. Form sheet metal in maximum lengths and keep joints to a minimum, with cut edges concealed.

C. Continuously weld all joints and seams except as otherwise indicated.

D. Conform to SMACNA recommendations for fabrication and construction details except as otherwise indicated.

E. FILLER PANELS: Sheet steel, 16 gauge, with mineral fiber core, and compressible gaskets or mastic sealing tape at all edges.

F. HEATING-COOLING ENCLOSURES: Steel sheet with louvers and grilles, removable tops and fronts, hinges across panels, sound deadening, built-in partitions (bulkheads) within enclosures at partition ends and window mullions; design and fabricate to support design load of 200 lbs. per square foot or 150 lbs. per linear foot, whichever is greater.

G. SHOP FINISHING: Comply with NAAMM "Metal Finishes Manual", to produce uniformly finished products, and for sheet steel, with SSPC-PA1.

H. COLORS: Provide colors indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

I. CLOSINGS AND TRIM: Sheet steel, 18 gauge, formed to tightly close with adjoining work.

J. Provide gaskets of closed-cell neoprene or mastic sealing tape for continuous seal to abutting surfaces.

3.2 SHEET STEEL FINISH

A. SURFACE PREPARATION AND PAINTING: Solvent-clean surfaces to comply with SSPC- SP1. Remove mill scale and rust, if present, to comply with SSPC-SP5 (while Metal Blast Cleaning) or SSPC-SP8 (pickling). For uncoated sheet steel, apply hot phosphate surface treatment to comply with SSPC-PT4

B. Apply shop primer to uncoated sheet steel immediately following surface preparation and pretreatment.

C. Apply shop primer to zinc-coated sheet steel immediately after surface preparation.

D. Apply baked enamel finish system to sheet to comply with paint manufacturer's specifications.

3.3 INSTALLATION

A. LOCATE AND PLACE: Locate and place miscellaneous sheet metal items plumb and level; in proper alignment with, and securely attached to, adjoining work.

B. PROTECT ALUMINUM SURFACES: Protect aluminum surfaces from corrosion where in contact with dissimilar metals, concrete or masonry by coating contact surfaces with zinc chromate primer or bituminous paint.

C. TOUCH-UP: Touch-up shop painted surfaces after installation, using same materials used in shop.

END OF SECTION

DIVISION 6 WOOD AND PLASTICS
06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Wood blocking, cants, and nailers
   2. Wood furring and grounds
   3. Plywood backing panels

B. Related sections include the following:
   1. Division 31 Section 31 31 16 Termite Control

1.2 SUBMITTALS

A. Submit product data for each type or process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Include data for insulating sheathing under-layment.

PART 2 PRODUCTS

2.1 LUMBER, GENERAL

A. Manufacture lumber, S4S and grade-stamped, to comply with PS20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
   1. Unseasoned lumber is not acceptable.
   2. For exposed lumber, apply grade stamps to ends of back of each piece or omit grade stamps entirely and issue certificate of grade compliance.

B. STUDS: 2x4, 2x6, 2x8 treated lumber. Nailers as recommended by manufacturer.

C. LUMBER FOR MISCELLANEOUS USES: Standard grade lumber for support of other work.

D. CONSTRUCTION PANELS: For types of concealed applications indicated below, provide wood panel products complying with PS 1 where applicable, and with "APA Performance Standard and Policies for Structural Use Panels (Form E445) for requirements indicated.
   1. For following types of applications where exposure durability classification or span rating is not given, provide EXPOSURE 1 and rating required to suit support spacing indicated.
      a) COMBINATION SUBFLOOR-UNDERLAYMENT: APA rated STURD-I-FLOOR.
      b) SUBFLOORING: APA rated sheathing.
      c) WALL SHEATHING: APA rated sheathing.
      d) ROOF SHEATHING: APA rated sheathing

E. PLYWOOD BACKING FOR ELECTRICAL AND TELEPHONE EQUIPMENT: APA C-D plugged INT with exterior glue, fire-retardant treated, 1/2" thick except as otherwise indicated.

F. HARDBOARD UNDERLAYMENT: 4'x4' panels complying with ANSI A135.4, Class 4 (service), Surface S1S, sanded on back side to uniform thickness of 0.215" OR 0.200", as standard with manufacturer, + - 0.005".

G. POLYSTYRENE BOARD SHEATHING: ASTM C 578, type IV, 4'x8', thickness as indicated on plans.

H. POLYISOCYANURATE BOARD SHEATHING: FS HH-I-1972, class as indicated below in thickness indicated:
   1. Class 1: Un-reinforced core, aluminum foil both sides.
   2. Class 2: Glass-fiber reinforced core.

I. GYPSUM SHEATHING: ASTM C 79, FS SS-L-30, Type II, class 2, form A and complying with the following requirements.
   1. GRADE W: Water-resistant treated core, 1/2" thick.
   2. GRADE X: Fire-resistant treated core, 5/8" thick.
   3. SIZE: 2' x 8', V-T&G long edges; 4'x8', square edges.

J. BUILDING PAPER: Asphalt saturated felt, non-perforated ASTM D 226.

2.2 FASTENERS AND ANCHORS

A. Of size, type, material and finish suited to application shown. Provide metal hangers and framing anchors of size and type recommended for intended use by manufacturer. Hot-dip galvanized fasteners and anchors for work exposed to weather, in ground contact and high relative humidity to comply with ASTM A 153.

2.3 PRESERVATIVES

A. Preservatives pressure treat lumber and plywood with water-borne preservatives to comply with AWPA C2 and C9, respectively, and with requirements indicated below:

   1. WOOD FOR GROUND CONTACT USE: AWPB LP-22.
   2. WOOD FOR ABOVE-GROUND USE: AWPB LP-2.

2.4 TREATMENT

A. Treat Cants, nailers, blocking, stripping, and similar items in conjunction with roofing, flashing, vapor barriers, and water proofing.

B. Treat sills, sleepers, blocking, furring, and other wood in direct contact with concrete or masonry.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. ROUGH CARPENTRY: Install rough carpentry work to comply with "Manual of House Framing" by National Forest Products Assoc. (N.F.P.A.) and with recommendation of American Plywood Assoc. (APA), unless otherwise indicated. For sheathing, underlayment

and other products not covered in above standards, comply with recommendations of manufacturer of product involved for use intended. Set carpentry work to required levels and lines, with members plumb and true and cut to fit.

B. FIRE-RETARDANT TREATED WOOD: Where wood is indicated for fire-retardant treatment comply with AWPA C20 (lumber) and AWPA C27 (plywood) for treatment type indicated below. Provide label of UL or other testing or inspection agency acceptable to authorities having jurisdiction on each piece treated. Redry treated lumber.
    1. INTERIOR TYPE A: Use where "FRTW" wood is indicated on interior.
    2. EXTERIOR TYPE: Use where "FRTW" is indicated for exterior exposed applications.

3.2 ATTACHMENT

A. Securely attach carpentry work to substrates and supporting members using fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials. Install fasteners without splitting wood; fasten panel products to allow for expansion at joints unless otherwise indicated.

3.3 FRAMING MEMBERS

A. Provide wood framing members of size and spacing indicated; do not splice structural members between supports. Fire stop concealed spaces with wood blocking not less than 2" thick, if not blocked by other framing members.

3.4 BLOCKING

A. Provide wood blocking not less than 1-1/2" thick and 3-1/2" wide to support cabinets, grab bars, towel bars, etc., and any other items attached to finished wall.

3.5 PROTECTION

A. Protect rough carpentry from weather. If despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA – registered label.

END OF SECTION

DIVISION 6 WOOD AND PLASTICS
06 20 00 FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Wood cabinets
   2. Shop finishing of interior woodwork

1.2 SUBMITTALS

A. Product Data: For each type of product (millwork and factory-fabricated items) indicated, including cabinet hardware and accessories and finishing materials and processes.
   1. Samples: Submit for lumber machined to stock and custom patterns, and Plywood for transparent finish.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large scale details, attachment devices, and other components.
   1. Show details full size
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in millwork
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Product Certificates: For each type of product, signed by product manufacturer

D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program Certificates.

E. Qualification data: for Installer

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide interior and exterior lumber materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise specified on drawings.

B. MOISTURE CONTENTS:
   1. Softwood: not to exceed 12%
   2. Hardwood: not to exceed 6%

C. EXTERIOR LUMBER: Refer to drawings for more information

D. INTERIOR LUMBER:
   1. Wood Base: Refer to Room Finish Schedule
   2. Door Frame

3. Door Casing:
4. Door: Book matched; As per Wood Doors specifications
5. Shelving: Maple Plywood with clear, natural finish, FAS grade exposed 2 sides, FAS grade with one side exposed. Sand exposed surfaces and provide solid maple banded edges.

2.2 HARDWARE

A. The contractor shall furnish and install all nails, screws, and finish hardware required in the assembling and securing of his work.

B. CABINET HARDWARE:
1. Drawers - One pair Knape & Vogt 1275 drawer end slides per drawer or approved equal.
2. Hinges - One pair Jay Bee/Ajax Pivot Hinge No.233 per drawer. Color selected by Architect.
3. Pulls - Jay Bee/Ajax 4" center Metro Pull one per door and drawer. Color selected by Architect.
4. Adjustable Shelves- Knap & Vogt 255 steel standards with 256 supports or equal.

C. OTHER HARDWARE:
1. Sliding Glass Doors- Knape & Vogt 992ZC assembly or equal.
2. Closet rod supports- Knape & Vogt 1195. Quantity-as required, but spans shall not exceed 4'-0".
3. Mirror Clips- Knape & Vogt 6092 or equal. Quantity-as required for size and weight of mirror(s) shown.
4. **Provide Knape & Vogt locks at all drawers and cabinet doors.**

2.3 CABINETS AND COUNTERS

A. LAMINATED PLASTIC: High pressure plastic laminate to meet or exceed NEMA premiums as manufactured by Wilsonart or Formica as follows, or an approved equal.
1. **PLASTIC LAMINATE BY WILSONART OR FORMICA: as selected from manufacturer’s premium colors.**

B. All plastic laminate countertops shall include a continuous molded backsplash and molded radius front edge.

C. ADHESIVE: Waterproof type as recommended by plastic manufacturer for type of use:

Sub-tops - 3/4" Plywood INT-DFPA-A-A
Plywood - Exposed 2 sides - INT-DFPA-A-A
Exposed 1 side - INT-DFPA-A-D
Framing – grade #1 or better maple
Drawers – grade #1 or better maple
Shelving - 3/4" plywood with solid maple edging.

PART 3 EXECUTION

3.1 INSTALLATION:

A. INSPECTIONS: Inspect finish materials, trim doors, etc. to insure that no sub- grade, defective, or machine marked pieces are installed.

B. PAINTING, BACKPAINTING, AND TRANSPARENT FINISH: Arrange to have all doors, interior finish cabinet work, miscellaneous trim, etc. primed, back painted, or stained and varnished immediately upon delivery to the building.

C. NAILING: Interior wood trim less than 4" wide, 6d casing nails not more than 12" o. c. staggered. Wider than 4", 2-6d casing nails 12"o.c.

3.2 DELIVERY, STORAGE AND PROTECTION:

A. Protect millwork, cabinetwork, hardware, etc. against damage, water moisture, and extreme temperature. Any damaged items shall be cause to reject said items at the contractor's expense.

B. FINISH HARDWARE: The supplier will mark each item of hardware for location. If hardware is delivered unmarked, return to supplier for marking.

C. Provide cleaned, properly sized and accurately placed mortises and drilled holes for all mortise hardware such as lock sets and for cylindrical locks where specified only. Any damaged, abused, or unproperly adjusted hardware shall be replaced by the contractor at his own expense.

D. Fit all surfaces applied hardware accurately, install, and make necessary adjustments for proper working order. Protect hardware by the use of heavy paper and masking tape and maintain until job is completed.

END OF SECTION

DIVISION 6 WOOD AND PLASTICS
06 61 16 SOLID SURFACING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:
   1. Countertops
   2. Cove backsplashes

B. Related Sections include the following:
   1. Finish Carpentry: Section 06 20 00.
   2. Sealants: Section 07 92 00.
   3. Plumbing: Division 22.

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:
   1. For each type of product indicated.
   2. Product data for the following:
      a. Chemical-resistant tops

B. Shop drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Product data:
   1. Indicate product description, fabrication information and compliance with specified performance requirements.

D. Fabricator/installer qualifications:
   1. Provide copy of certification number.

E. Manufacturer certificates:
   1. Signed by manufacturers certifying that they comply with requirements.

F. NSF/ANSI standards:

1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone — all food types.

G. Maintenance data:
   1. Submit manufacturer’s care and maintenance data, including repair and cleaning instructions.
      a. Maintenance kit for finishes shall be submitted.
   2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. National Electrical Manufacturers Association (NEMA)
      d. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) 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.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

A. Provide manufacturer’s warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.

B. Manufacturer’s warranty period:
   1. Ten years from date of substantial completion.

1.8 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following:
   a. Corian® surfaces from the DuPont company
   b. Hanex Solid Surfaces
   c. Vicostone Quartz Surfaces
   d. LG Hausys Hi-Macs
   e. Wilsonart
   f. or approved equal

2.2 MATERIALS

A. Solid polymer components
1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:
1. 1/2 inch

C. Edge treatment:
1. Full Bullnose

D. Backsplash:
1. Applied.

E. Sidesplash:
1. Applied.

F. Performance characteristics:

Property	Typical Result	Test
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell “M” Scale ASTM D 785
	56	Barcol Impressor ASTM D 2583
Thermal Expansion	3.02 x 10^{-5} in./in./°C (1.80 x 10^{-5} in./in./°F)	ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6

Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—½ lb. ball: ¼" slab—36" drop ½" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (¾") 0.6% (½") 0.8% (¼")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test (“LC50”Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: ¼" (6 mm) 2.2 lbs., ½" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:
1. Manufacturer’s standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:
1. Manufacturer’s standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

D. Conductive tape:
1. Manufacturer’s standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

E. Insulating felt tape:
1. Manufacturer’s standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 FACTORY FABRICATION

A. Shop assembly
1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.

2. Form joints between components using manufacturer’s standard joint adhesive without conspicuous joints.
   a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
   a. Rout cutouts, radii and contours to template.
   b. Smooth edges.
   c. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Color:
   a. **As selected from the manufacturer’s colors (mid-price group)**
      Verify with South Texas College to match existing color.

B. Finish:
   1. Provide surfaces with a uniform finish.
      a. Matte; gloss range of 5–20.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide product in the largest pieces available.
   2. Form field joints using manufacturer’s recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed joints/seams shall not be allowed.
   3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   4. Cut and finish component edges with clean, sharp returns.
   5. Rout radii and contours to template.
   6. Anchor securely to base cabinets or other supports.
   7. Align adjacent countertops and form seams to comply with manufacturer’s written recommendations using adhesive in color to match countertop.
   8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
   9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

B. Coved backsplashes and applied sidesplashes:
   1. Install applied sidesplashes using manufacturer’s standard color-matched silicone sealant.
   2. Adhere applied sidesplashes to countertops using manufacturer’s standard color-matched silicone sealant.

C. Coved backsplashes and sidesplashes:

1. Provide coved backsplashes and sidesplashes at all walls and adjacent millwork.
2. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on the drawings.
3. Adhere to countertops using manufacturer’s standard color-matched Joint Adhesive.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect’s satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.

B. Remove adhesives, sealants and other stains.

END OF SECTION

DIVISION 7 THERMAL AND MOISTURE PROTECTION
07 21 00 BUILDING INSULATION

(provide only non-asbestos products)

PART 1 GENERAL

1.1 WORK INCLUDED

A. Exterior Walls

B. Ceiling Insulation

1.2 PRODUCT HANDLING

A. PROTECTION: Deliver to site; store in dry place with labels intact. Protect materials before, during, and after installation. Protect installed work of other trades.

B. REPLACEMENTS: In event of damage, make necessary repairs and replacements.

PART 2 PRODUCTS

2.1 BUILDING INSULATION

A. Insulation shall be the product indicated or an equal approved in advance by the Architect. Location and type of each insulation listed below re: to Drawings.

1. RIGID WALL INSULATION: Refer to section 07 21 10 – Board Insulation
2. WALL INSULATION: Wall injected foam in CMU, from finish floor to top of wall.
3. CEILING INSULATION: Owens- Corning, R-19, craft paper unless otherwise indicated.
4. METAL BUILDING INSULATION: Specified in section 13 34 19, Pre-Engineered Structures (by pre-engineered building supplier).

2.2 SEALANTS

A. The following sealants shall be used unless otherwise specified.

1. Silicone Foam: Dow Corning Fire Stop Foam. (non-asbestos)
2. Caulk: 3M, Fire Barrier CP-25.

2.3 MASTIC

A. Provide mastic for rigid wall insulation as recommended by manufacturer.

2.4 OTHER MATERIALS

A. Fasteners, retainers or other materials not specifically described shall be as selected by Contractor and approved by Architect.

PART 3: EXECUTION

3.1 SURFACE CONDITIONS

A. INSPECTION: Prior to work of this Section, inspect installed work and verify that this installation may properly commence.

1. Verify that insulation may be installed in accordance with original design and manufacturer's recommendations.

B. DISCREPANCIES: In event of discrepancy, notify Architect.
1. Do not proceed until discrepancies have been resolved.

3.2 INSTALLATION:

A. GENERAL: Install insulation in accordance with manufacturer's current edition of insulation application instructions.

B. Install safing insulation and/or sealant at all fire wall penetrations of structural members, control joints, expansion joints, openings, etc. and as indicated on drawings in accordance with local code authority.

3.3 INSPECTION

A. Verify that all insulation work is properly installed and complete.

END OF SECTION

DIVISION 7 THERMAL AND MOISTURE PROTECTION
07 60 10 FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.

B. Refer to each trade specification section for more specific information and requirements for sheet metal work to be performed in conjunction with each respective trade.

1.3 SUBMITTALS

A. Product Data; Flashing, Sheet Metal, Accessories: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

B. Samples; Flashing, Sheet Metal, Accessories: Submit 8" square samples of specified sheet materials to be exposed as finished surfaces.

1.4 JOB CONDITIONS:

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS:

A. SHEET METAL FLASHING/TRIM:
   1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359" thick (20 gauge) except as otherwise indicated.
   2. Elastic Sheet Flashing/Membrane: Manufacturer's standard flexible, elastic, black, non reinforced, flashing sheet of 50-65 mils thickness; 50-70 Shore A Hardness (ASTM D 2240); 1200 p. s. i. tensile strength (ASTM D 412); 120 lbs. per linear in. tear resistance (ASTM D 624,Die C); ultimate elongation of 250% (ASTM D412); brittleness temperature of -30 deg. F (-35 deg. C) (ASTM D746); resistance to ozone aging of no cracks for 10% elongation sample for 100 hours in 50 pphm (50.5 mPa) ozone at 104 deg.F (70 deg. C) (ASTM D 1149); resistance to heat aging of max. hardness increase of 15 points, elongation reduction of 40%, and tensile strength reduction of 30%, for 70 hours at 212 deg. F (100 deg. C) (ASTM D 573).
   3. Provide EPDM synthetic rubber sheet.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES:

A. Solder: For use with steel or copper, provide 50-50 tin/lead solder (ASTM B 32, with rosin flux.

B. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

C. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, nondrying, non-migrating sealant.

E. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FSTT-S-0027, TT-S-00230, or TT-S-001543.

F. Epoxy Seam Sealer: 2-Part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

G. Adhesives: Type recommended by flashing sheet manufacturer for waterproof / weather - resistant seaming and adhesive application of flashing sheet.

H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

I. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

J. Roofing Cement: ASTM D 2822, asphaltic.

2.3 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansive type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations on contact, with bituminous coating or other permanent separation as recommended by manufacturer/ fabricator.

PART 3 - EXECUTION:

3.1 INSTALLATION REQUIREMENTS:

A. General: Except as otherwise indicated, comply with manufacturer's installations instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementations or wood substrates, install a slip sheet or red rosin paper and a course of polyethylene underlayment. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

C. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division-3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division-4 sections.

D. Install counter-flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

E. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheet with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

F. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6". Fabricate seams at joints between units with minimum 3" overlap, to form a continuous waterproof system.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION

DIVISION 7 THERMAL AND MOISTURE PROTECTION
07 92 00 JOINT SEALERS

(Very Low VOC as Indicated: Section 2.3.E)

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the applications indicated in the Joint-Sealant Schedule at the end of Part 3.
   1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:
      a. Control and expansion joints in unit masonry.
      b. Joints in exterior Portland cement stucco
      c. Joints between metal panels.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
      f. Control joints in ceilings and other overhead surfaces.
      g. Other joints as indicated.
   2. Exterior joints in the following horizontal traffic surfaces:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Joints between different materials listed above.
      c. Other joints as indicated.
   3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
      e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      f. Other joints as indicated.
   4. Interior joints in the following horizontal traffic surfaces:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control joints in tile flooring.
      c. Other joints as indicated.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

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 type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Qualification Data: For Installer.

F. Compatibility and Adhesion 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 needed for adhesion.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

B. Perform work in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
   1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   2. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

E. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural 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 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, 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 sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Single-Component Non-sag Polyether Sealant ES-A **(Very Low VOC [less than 2%])**:
   1. Available Products **Very Low VOC (less than 2%)**
      a. STS Coatings, GreatSeal PE-.150 (830-995-5177)

b. Sonneborn, Division of BASF: Sonolastic 150.
c. Sherwin-Williams, Stampede 1H.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Use O Joint Substrates: galvanized steel, brick, and concrete.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
7. **Exterior Gypsum Joint Sealants (<u>Very Low VOC less than 2%</u>) (IECC Required)**
   a. LT-100 Sealant by STS Coatings (830-995-5177)
   b. UniverSeal by York Mfg. (800-551-2828)

D. Single-Component Neutral-Curing Silicone Sealant ES- B:
   1. Available Products:
      a. Sonneborn, Division of ChemRex Inc., BASF; Omniseal 50.
      b. Dow Corning Corporation; 795
      c. GE Silicones; SilPruf NB SCS9000.
      d. Pecora Corporation; 895.
   2. Type and Grade: S (single component) and NS (nonsag).
   3. Class: 50.
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Glass and color anodic aluminum.

E. Single-Component Acid-Curing Silicone Sealant ES-C:
   1. Available Products:
      a. Dow Corning Corporation; 999-A.
      b. GE Silicones; Sanitary SCS1700.
      c. Pecora Corporation; 860.
      d. Sonneborn, Division of ChemRex Inc.; OmniPlus.
      e. Tremco; Tremsil 200.
      f. Sherwin-Williams, Silicone Rubber
   2. Type and Grade: S (single component) and NS (nonsag).
   3. Class: 25.
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: ceramic tile and stainless steel.

F. Multicomponent Nonsag Urethane Sealant ES-D:
   1. Available Products:
      a. Sonneborn, Division of ChemRex Inc.; NP 2.
      b. Sherwin-Williams, Stampede 2NS.
   2. Type and Grade: M (multicomponent) and NS (nonsag).
   3. Class: 25.
   4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Color anodic aluminum, galvanized steel, brick, and ceramic tile.

G. Multicomponent Pourable Urethane Sealant ES-E:
   1. Available Products:
      a. Pecora Corporation; Dynatrol II-SG.
      b. Sika Corporation, Inc.; Sikaflex - 2c SL.
      c. Sonneborn, Division of ChemRex Inc.; SL 2.
      d. Sherwin-Williams, Stampede 2 SL.
   2. Type and Grade: M (multicomponent) and P (pourable).
   3. Class: 25.
   4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: ceramic tile and concrete.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints AS-A: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
   1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   2. Available Products:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are 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. Elastomeric Tubing Sealant Backings: Neoprene, butyl, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 PLASTIC FOAM JOINT SEALERS:

A. Preformed, compressible, resilient, nonwaxing, nonextruding strips of plastic foam of material indicated below, and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.7 LATEX SEALANT APPLICATION STANDARD:

A. Install sealant, including forming, packing and other accessory materials to fill opening around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated.

2.8 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 joint-sealant performance.

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, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 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. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type 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.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. 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.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
   1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
   2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
   3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
   4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

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 elastomeric sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab or Method D, Water Immersion in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
   4. Inspect tested joints and report on the following:
      a. 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 type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
      b. Whether sealants filled joint cavities and are free of voids.
      c. Whether sealant dimensions and configurations comply with specified requirements.
   5. 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 fill, sealant configuration, and sealant dimensions.

6. 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 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

Location	Type	Color
A. Window Perimeter, Frames, Storefront Or Curtain Wall Assembly	B	To Match Adjacent
B. Door Frames / Wall Perimeters	A	To Match Adjacent
C. Under Thresholds Under Window system which rests directly on the floor slab in order to prevent infiltration	A	Black
D. Toilet Room Fixtures, Accessories Ceramic Tile	C	White
E. Intersection of dissimilar materials that allows water or air infiltration	A	To Match Adjacent
F. Perimeter Joints on interior side of door Frames, louvers in exterior walls	A	To Match Adjacent
G. Perimeter Joints of door frames, window frames And other framed openings in walls with no Finished edge flange.	A	To Match Adjacent
H. Open Joints at penetrations through walls, and open joints at penetrations through concrete or gypsum board ceilings, where intended to be tight sealed joints	A	To Match Adjacent
I. Open Joint, between dissimilar materials where intended to be tight, sealed joint.	A	To Match Adjacent
J. Joints where edge trim of gypsum board abuts irregular surfaces or other surfaces and leaves open joint	A	To Match Adjacent
K. Within and perimeter of Masonry System	A	To Match Adjacent

L.	Intersection of dissimilar materials which installations not uniform or where workmanship does not meet acceptable construction tolerances, when such workmanship is acceptable by the Architect.	A	To Match Adjacent
M.	Metal Siding, louvers, fixtures and other penetrations in building enclosures not otherwise sealed weathertight. Unless noted otherwise provide continuous sealing perimeter joints and all other joints at exterior soffits.	A	To Match Adjacent
N.	Paving Floors joints Expansion joints in and around concrete pavement, curbs, or other horizontal surfaces. In horizontal joints in concrete floor where intended to be tight, sealed joints. Expansion joints in concrete slabs, around column piers penetrating concrete slab, at all natural concrete slab expansion control points as specified	E	To Match Adjacent
O.	Within Glazing Systems	B	To Match Adjacent
P.	Within Roofing System	A, D	To Match Adjacent

END OF SECTION

DIVISION 8 DOORS AND WINDOWS
08 11 00 STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, door schedule, and shop drawings that indicate general construction, configurations, jointing methods, reinforcements, and location of hardware.
   1. Provide manufacturers installation instructions and cut sheets for fire and smoke seals as required to comply with UL-10C and UL 1784

B. Comply with ANSI/SDI 100.

C. Fire-Rated Door Assemblies: NFPA 80, tested per ASTM E 152 and tested to meet UL 10B and 10C for neutral and positive pressure requirements. Labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 QUALITY ASSURANCE

A. Applicable Standards: Specifications and standards of SDI 100 (ANSI A250.8-2003).

B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 and have been tested, listed, and labeled in accordance with ASTM E2074-2001.
   1. Oversize Fire-Rated Door Assemblies: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, provide certificate or label from approved independent testing and inspection agency, indicating that door and frame assembly conforms to requirements of design, materials and construction as established by individual listings for tested assemblies.
   2. Temperature Rise Rating: At stairwell enclosures, provide doors, which have Temperature Rise Rating of 450 degrees F maximum in 30 minutes of fire exposure.
   3. Smoke and Fire Door Seals: Door supplier to provide UL-10c and UL1784 compliant seals as required at labeled openings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M.

B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M or ASTM A 620/A 620M.

C. Galvanized Steel Sheets: ASTM A 653/A 653M, commercial steel, or ASTM A 642/A 642M, drawing quality, with A40 or A60 (ZF180 or Z180) coating designation, mill phosphatized.

2.2 STEEL DOORS AND FRAMES

A. Hollow metal doors and frames shall be from one of the following:
   1. Dean Steel Manufacturing Co.
   2. Allied Steel Products, Inc.
   3. Ceco Corp.
   4. or approved equal

B. Insulated, hollow metal doors shall be constructed with continuous vertical 16 ga channels and horizontal inverted 16 ga top and bottom channels. Hinge and lock reinforcements must be projection welded to the vertical channels.

C. Steel Doors: 1-3/4-inch thick of materials and ANSI/SDI 100 grades and specified below.
   1. Exterior Doors: GRADE III, extra heavy-duty, Model 3, insulated, full flush design, minimum 16 ga. thick, G-90 hot-dip galvanized.
   2. Fire rated doors as required by codes.

D. Door Louvers: sight proof per SDI 111C.
   1. Fire-Rated Automatic Louvers: Actuated by fusible links at 150 deg F(65 deg C) and listed and labeled.
   2. Provide sight proof louvers for interior doors where indicated, constructed of 24-gauge steel V-shaped or y-shaped blades, set into 20-gauge steel frame.
   3. Provide weatherproof louvers with insect screen for exterior doors where indicated, constructed of 18 ga. steel.

E. Door Silencers: Three on strike jambs of single-door frames and two on heads of double-door frames.

F. Plaster Guards: Provide 26 gauge where mortar might obstruct hardware operation and to close off interior of openings.

G. Fabricate steel frames to be rigid, neat in appearance, and free from defects, warp, or buck-le.
   1. Interior Frames: Fabricate with mitered or coped **and face welded corners** formed from **16** ga. thick, cold-rolled steel for openings indicated on the drawings.
   2. Exterior Frames: Fabricate with mitered or coped and face welded corners, formed from 16 ga. thick steel sheet.

H. Prepare doors and frames to receive hardware that is not surface applied according to SDI 107, see Division 8 Section “Door Hardware”.

I. Sealants: Per SDI 100 / ANSI A250.8 Appendix B (water penetration).

J. Metal Door Frame Undercoating: Per SDI 100 / ANSI A250.8 section 4.2.2.

K. Prime Coat: Standard manufacturers primer per SDI 100 / A250.8 section 2.05.

L. Door Schedule: Provide materials and products that result in colors and finishes of surfaces complying with the Door Schedule.

2.3 ANCHORS AND ACCESSORIES

A. Manufacturer's standard units. Use galvanized items for units built into exterior walls, complying with ASTM A 153.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place steel frames to comply with SDI 105.

B. Install steel doors accurately in frames, within clearances specified in ANSI/SDI 100.
   1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
   2. Smoke-Control Doors: Comply with NFPA 105.

C. DOORS AND FRAMES must be stored elevated from the floor and warranty requires they be stored in cool, dry place.

END OF SECTION

DIVISION 8 DOORS AND WINDOWS
08 14 16 FLUSH WOOD DOORS

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Furnish and deliver to the job site all wood doors indicated on the Drawings, specified herein, or needed for a complete and proper installation.

B. RELATED SECTIONS
   1. Section 06 20 00 - Finish Carpentry
   2. Section 08 11 00 - Steel doors and frames
   3. Section 08 71 00 - Finish hardware

1.2 QUALITY ASSURANCE

A. Qualifications of manufacturer: All wood doors shall bear the NWMA seal approval. Fire doors shall also bear the UL label for the designated rating.

B. All doors to be sourced from single manufacturer.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 23.

B. Shop drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts, special beveling, hardware blocking in fire-resistant composite core doors, identify cutouts.

C. Indicate compliance with specified fire rating

D. Construction samples: Submit one or more of manufacturer’s standard samples demonstrating door construction.

E. Finish samples: Sample to illustrate the color of the specified door face materials.

F. Manufacturer’s full lifetime warranty

G. Glass size, type, pattern and thickness for factory glazed doors.

1.4 GUARANTEE

A. Upon delivery of the doors of this Section to the job site, and as a condition of their acceptance, deliver to the Architect two copies of an agreement written on the door manufacturer's standard form, signed by the door manufacturer and the Contractor agreeing to replace or repair defective doors which have warped (bow, cup, or twist) or which show photographing of construction below in wood veneer faces, as defined by the NWMA Standard Door Guarantees, except the NWMA provision for refunding the price received by the door manufacturer for any defective door shall not apply. The guarantee shall also include refinishing and reinstalling with may be required due to repair or replacement of effective doors. Guarantee shall be in effect for a period of five years following date of acceptance.

1.5 PRODUCT HANDLING

A. Protection:
   1. Protect the materials of this Section during transit, storage, and handling to prevent deterioration, damage, and soiling.
   2. Package each door at the factory in separate heavy paper-type carton. Mark each carton for location to correspond with opening number on the Drawings.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.6 COORDINATION

A. Coordinate work under provisions of Section 01 40 00 Project Coordination.

B. Coordinate the work with door opening construction, door frame and door hardware installation with a pre-installation conference.

1.7 WARRANTY

A. Provide manufacturer's warranty to the following term:
   1. Interior Solid Core Doors: "Full Life of Original Installation" including hanging and finishing if door(s) do not comply with warranty tolerance standards.
   2. Coverage for delamination, warping, bow, cup and telegraphing of core construction as outlined in the WDMA Standards.

PART 2: PRODUCTS

2.1 MANUFACTURER

A. Graham Manufacturing/Assa Abloy
B. VT Industries
C. OshKosh Door Company
D. or approved equal
   1. Requests for substitutions will be considered in accordance with provisions of Section 01 10 00, Item 1.18 and 1.29.

2.2 WOOD DOORS

A. General: Wood doors shall be of the sizes, types, and designs shown on the Drawings.

B. Adhesives and bonds: Use only adhesives and bonds conforming to the NWMA I.S.-1 standards, type II, for interior wood doors. Adhesives shall be non-staining.

C. Warp tolerances shall be in correspondence with A I.S.

D. Flush doors
   1. Except as otherwise directed, flush doors and transoms shall conform to the requirements of the A WI PC-7, particleboard, 7 ply bonded core doors, or 5 ply system to meet or exceed that specified.
   2. Required louvers shall be hardwood slats not less than 6 mm (1/4") in thickness, finished to match the door.
   3. Glazed openings: Glaze the doors where called for the Drawings, providing glass and glazing in accordance with the requirements specified in the drawings.
   4. Face skins:
      a) Doors shall be pre-finished – Rotary cut natural White Birch – AWI Premium Grade Finish. Book match veneer grain, and natural clear finish.

5. Solid Color Doors shall conform to the requirements of AWI Type APC.

E. Vertical stiles, nonrated and 20 minute rated.
   1. Matching hardwood outer stile edge, 9/16" minimum before trim.
   2. Overall stiles 1 3/8" minimum rated.

F. Rail edges, nonrated and 20 minute rated.
   1. Mill option, softwood or hardwood.
   2. 2" minimum after trim.

G. Label Fire Door Core, 45 minute, 1 hour, 1 1/2 hour.
   1. Noncombustible mineral
   2. Containing no asbestos.

H. Vertical stile, 45 minute, 1 hour, 1 1/2 hour rated doors.
   1. Visually compatible with face veneer.
   2. Minimum 1 1/8 " thick.
   3. Laminated for improved screw holding and split resistance.
   4. Matching edges

I. Rail edges, 45 minute, 1 hour, 1 1/2 hour rated doors.
   1. Top rail 1 1/4"minimum hour
   2. Bottom rail 1 1/2" minimum.
   3. Containing no asbestos.

J. **Rating for fire doors as called for in door schedule.**

K. All wood doors should have a Lifetime Warranty.

2.3 PRE-FITTING AND PREPARATION FOR HARDWOOD

A. Pre-fit and pre-machine all wood doors at factory.

B. Pre-machine doors in accordance with final approves hardware and frame schedule.

C. Fire doors shall be machined in strictcompliance to provision of NFPA-0 latest edition.

D. Pre-machine doors within industry tolerance. "A plus or minus 1/32" will be allowed on all hardware locations. A plus or minus 1/32" minus 1-inch tolerance will be allowed on hinge cutouts. A plus 1/64" minus 0-inch tolerance will be allowed on lock from preparation cutouts.

2.4 ACCESSORIES

A. LOUVERS
   1. Wood louvers as detailed on the elevations.
   2. Louvers to be furnished and installed by the door manufacturer.
   3. Return Air Grills (RAG’s): Refer to mechanical drawings and specifications for size and location.

B. GLAZING STOPS
   1. Non-Rated and 20 minute
      a. Manufacturers Standard Metal Vision Frames.
      b. W-8 Reveal Lite Molding
   2. Fire-Rated 45 minute or above
      a. Manufacturers Standard Metal Vision Frames.
      b. Verify compatibility of glazing system with positive pressure requirements.
      c. As specified in drawings.

C. GLASS & GLAZING IN WOOD DOORS
   1. Glass and glazing provided by the wood door manufacturer

D. MEETING EDGES FOR PAIRS OF FIRE RATED DOORS
   1. No metal meeting edges.

2.4 FABRICATION

A. General
   1. Comply with AWI Quality Standards except to meet or exceed requirements herein specified.
   2. Completely factory pre-fit to required size ready to installation at project site, no on-jobsite trimming permitted.
   3. Prepare in accordance with frame in accordance with frame shop drawings and schedule, hardware schedule, and templates.

B. Fabricating Tolerance
   1. Pre-fit size: Plus or minus 1/32" overall dimensions.
   2. Squareness: Length or diagonal measured on upper left corner to lower right corner with maximum difference of 1/8"
   3. Maximum warp 1/4"
   4. Show-through (telegraphing): 1/100" deviation from true plans.

PART 3 EXECUTION

3.1 EXAMINATION

A. Notify Architect of any conditions that would adversely affect the installation or subsequent use of the doors. Do not begin installation until all conditions are acceptable.

B. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

C. Verify that opening sizes and tolerances are acceptable and ready to receive this work.

3.2 INSTALLATION

A. Install fire-rated and non-rated doors in accordance with NFPA 80, manufacturers’ instructions and to ITS-WH/UL requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum 3/4 inch (19-mm).

D. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

E. DO NOT TRIM POSITIVE PRESSURE RATED DOORS FOR WIDTH

F. Pilot drill screw and bolt holes using templates provided by hardware manufacturer. [Use threaded through bolts for half surface hinges].

G. EXERCISE CAUTION WHEN DRILLING PILOT HOLES AND INSTALLING HINGES SO THAT PILOT HOLES ARE NOT OVER DRILLED AND SCREWS ARE NOT OVER TORQUED. FOLLOW MANUFACTURERS INSTALLATION INSTRUCTIONS FOR POSITIVE PRESSURE DOORS.

H. Coordinate installation of doors with installation of frames and hardware

I. Manufacturer shall install glass in wood doors

J. Install door louvers and light kits plumb and level.

K. Reseal or refinish any doors that required site alteration.

3.3 WARRANTY TOLERANCES

A. Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

3.5 CLEANING

A. Clean doors immediately after installation in accordance with manufacturers Care and Handling Instructions.

3.6 PROTECTION

A. Protect installed doors from damage during construction.

END OF SECTION

DIVISION 8 DOORS AND WINDOWS
08 71 00 FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section comprises of furnishing and installing hardware specified herein and noted on drawings for a complete and operational system, including any electrified hardware components, systems, controls and hardware for aluminum entrance doors. Any door shown on the drawing and not specifically referenced in the hardware sets shall be provided with identical hardware as specified on other similar openings and shall be included in the General Contractor’s base bid. All fire rated door shall be provided with fire rated hardware as required by local code Authority as part of the General Contractor’s base bid. The hardware supplier shall verify all cylinder types specified for locking devices supplied as part of the door system with the door manufacturer and/or door supplies.

B. The General Contractor shall notify the Architect in writing of any discrepancies (five (5) days prior to bid date) that could and/or would result in hardware being supplied that is none functional, hardware specified and/or hardware that has not been specified that will result in any code violations and any door that is not covered in this specification. Failure of the General Contractor to address any such issue shall be considered acceptance of the hardware specified and all discrepancies shall be corrected at the General Contractor’s expense and considered a part of their base bid. Change orders shall not be issued if deemed by the Architect and/or South Texas College to fall under and/or be covered as a part of the General Contractor base bid, due to failure to comply with this instruction notification.

C. Items include but are not limited to the following:
1. Hinges - Pivots
2. Flush Bolts
3. Exit Devices
4. Locksets and Cylinders
5. Push Plates - Pulls
6. Coordinators
7. Closers
8. Kick, Mop and Protection Plates
9. Stops, Wall Bumpers, Overhead Controls
10. Electrified Hold Open Devices
11. Thresholds, Seals and Door Bottoms
12. Silencers
13. Miscellaneous Trim and Accessories

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification sections, apply to this section.

1.03 RELATED WORK specified elsewhere that should be examined for its effect upon this section:

A. Section 06 20 00 - Finish Carpentry
B. Section 08 11 00 – Steel Doors and Frames
C. Section 08 14 16 – Flush Wood Doors
D. Sections within 09 91 00 – Paints & Coatings
E. Division 26 – Electrical
F. Division 28 – Access Control

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. NFPA-80 - Standard for Fire Doors and Windows
B. NFPA-101 - Life Safety Code

C. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
D. ANSI-A 117.1 - American National Standards Institute - Accessible and Usable Buildings and Facilities
E. ANSI-A 156.5 - American National Standards institute -Auxiliary Locks and Associated Products
F. UFAS - Uniform Federal Accessibility Standards
G. UL - Underwriter’s Laboratories
H. WHI - Warnock Hersey International, Testing Services
I. State and Local Codes including Authority Having Jurisdiction
J. U.B.C.7-2-97 and UL10C
K. IBC-2012 – International Building Code
L. NFPA-70– International Electrical Code

1.05 SUBMITTALS

A. HARDWARE SCHEDULES submit copies of schedule in accordance with Division 1, General Requirements. Schedule to be in vertical format, listing each door opening, including: handing of opening, all hardware scheduled for opening or otherwise required to allow for proper function of door opening as intended, and finish of hardware. At doors with door closers or door controls include degree of door opening. Supply the schedules all Finish Hardware within two (2) weeks from date purchase order is received by the hardware supplier.

B. Submit manufacturer’s cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.

C. Certification of Compliance:
1. Submit any information necessary to indicate compliance to all these specifications as required.
2. Submit a statement from the manufacturer that electronic hardware and systems being supplied comply with the operational descriptions exactly as specified.

D. Submit any samples necessary as required by the Architect.

E. Templates for finish hardware items to be sent to related door and frame suppliers within three (3) working days of receipt of approved hardware schedule.

F. Doors and Frames used in positive pressure opening assemblies shall meet UL10C in areas where this specification includes Seals for smoke door.

1.06 QUALITY ASSURANCE

A. Hardware supplier to be a qualified, Factory Authorized, direct distributor of the products to be furnished. In addition, the supplier to have in their regular employment an AHC or AHC /CDC and/or a person of equivalent experience (minimum fifteen (15) years in the industry) who will be made available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the finish hardware on this project.

B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL. (Underwriter’s Laboratories) approved for fire. Exit devices in non-labeled openings to be listed for panic.

1.07 DELIVERY, HANDLING AND PACKAGING

A. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.

B. Pack each item of hardware completes with all necessary parts and fasteners.

C. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.

1.08 SEQUENCING AND SCHEDULING

Any part of the finish hardware required by the frame or door manufacturers or other suppliers that is needed to produce doors or frames is to be sent to those suppliers in a timely manner, so as not to interrupt job progress.

1.09 WARRANTY

All finish hardware shall be supplied with a One- (1) year warranty against defects in materials and workmanship, commencing with substantial completion of the project except as follows:

1. All Closers are to have a thirty- (30) year written warranty.
2. All Exit Devices are to have a three- (3) year written warranty.
3. All Locksets (Grade 1) are to have a ten- (10) year written warranty.
4. All Continuous Hinges are to have a ten- (10) year written warranty.

PART 2 – PRODUCTS

2.01 FASTENERS

A. Furnish with finish hardware all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. All closers and exit devices on labeled wood doors shall be through-bolted if required be the door manufacturer. All thresholds shall be fastened with wood screws and plastic anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.

C. Design of all fastenings shall harmonize with the hardware as to material and finish.

D. All hardware shall be installed with the Manufacturers standard screws as provided. The use of any other type of fasteners shall not be permitted. The general contractor shall provide wood blocking in all stud walls specified and/or scheduled to receive wall stops, No Exception.

2.02 ENVIRONMENTAL CONCERN FOR PACKAGING

Hardware shipped to the project jobsite shall be packaged in biodegradable packs such as paper or cardboard boxes and wrapping.

2.03 HINGES

A. All hinges to be of one manufacturer as hereafter listed for continuity and consideration of warranty. Provide one of the following manufacturers Ives, Hager or Stanley.

B. Unless otherwise specified provide five-knuckle, heavy-duty, button tip, full mortise template type hinges with non-rising loose pins. Provide non-removable pins for out swinging doors at secured areas or as called for in this specification (Refer to 3.02 Hardware Sets).

C. Provide exterior and interior out-swinging door hinges of stainless steel, bronze or steel with non-removable pins or security studs as called for in 3.02 Hardware Sets.

D. Provide exterior and interior in-swinging door hinges of plated steel, bronze or stainless steel as called for in 3.02 Hardware Sets.

E. Provide size 4½” x 4½” for all 1¾” thick doors up to and including 36 inches wide. Doors over 1¾” through 2¼” thick, use 5” x 5” hinges. Doors over 36 inches use 5” x 4½” unless otherwise noted in 3.02 Hardware Sets.

F. Were required to clear the trim and/or to permit the doors to swing 180 degrees furnish hinges of sufficient throw.

G. Provide heavy weight hinges on all doors over 36 inches in width.

H. Provide labeled and none labeled doors with stainless steel bearing-type hinges.

I. Continuous hinges shall be Ives as specified or equal products manufactured by ABH or Select Products.

2.04 LOCK AND LOCK TRIM

A. All locksets, latch sets, and trim to be of one manufacturer as hereafter listed for continuity of design and consideration of warranty. Locksets shall be provided as specified and are Schlage “ND” series with the Sparta (SPA) lever. All locks and cylinders shall be Schlage Primus Level III weather specified in the hardware sets or not.

B. Provide metal wrought box strike boxes and curved lip strikes with proper lip length to protect trim of the frame, but not to project more than 1/8 inch beyond frame trim or the inactive leaf of a pair of doors.

C. Mechanical Locks shall meet ANSI Operational Grade 1, Series 4000 as specified.
1. Hand of lock is to be field reversible or non-handed.
2. All lever trim is to be through-bolted through the door.
3. All pairs off doors shall be provided with a 14-042 ¾” latch bolt throw if required by UL.
4. All single doors specified with sound seals shall be provided with a 14-028 (3-3/4”) Latch bolt.

2.05 CYLINDERS AND KEYING

A. Provide locks and Exit devices requiring cylinders with Schlage Primus Level III large format interchangeable core cylinder key system and comply with performance requirements of ANSI A156.5. All keys shall be of nickel silver material only. All locks are to be factory keyed to the existing Primus Level III master key system (which shall be factory maintained) as directed by South Texas College and the Architect. The hardware supplier shall meet with the General Contractor, the Architect, a Representative the Lock manufacturer and South Texas College at the project site to determine all permanent keying requirements. <u>The hardware supplier shall provide two key blanks per door (Stamped as required) for South Texas College use as needed.</u>

B Furnish all exterior and interior locks, cylinders and Exit devices with temporary construction master keyed large format interchangeable cores for the duration of construction. Provide ten (10) construction keys total and two (2) construction core control keys total.

C. Cylinders shall be factory keyed and factory maintained as directed by the South Texas College and the Architect. Provide three- (3) keys per cylinder and six- (6) master keys per master used.

D. Factory stamp all keys “Do not duplicate” and with key symbol as directed by South Texas College.

E. <u>The hardware supplier shall supply the factory bitting list for the project to be supplied with the permanent cores.</u>

F. The hardware supplier shall supply 20 each Primus level III full size IC cores (0-bitted) to be supplied with the permanent cores.

2.06 EXIT DEVICES

A. All exit devices and trim, including electrified items, to be of one manufacturer as hereafter listed and in the hardware sets for continuity of design and consideration of warranty; electrified devices and trim to be the same series and design as mechanical devices and trim.

B. Exit Devices to be “UL” listed for life safety. All exit devices for labeled doors shall have “UL” label for “Fire Exit Hardware”. All devices mounted on labeled wood doors are to be through-bolted or per the manufacturer’s listing requirements. All devices shall conform to NFPA 80 and NFPA 101 requirements.

C. All exit devices to be of a heavy duty, chassis mounted design, with one-piece removable covers, eliminating necessity of removing the device from the door for standard maintenance and keying requirements.

D. All trims to be through-bolted to the lock stile case. Lever design to be the same as specified with the lock sets (“17” design).

E. Exit Devices to be the modern push rail design embossed “PUSH”. All exit devices shall be mounted with sex bolts as provided by the manufacturer.

F. All devices shall carry a three- (3) year warranty against manufacturing defects & workmanship.

G. Exit Devices shall be Von Duprin 33 or 99 series as specified.

2.07 SURFACE MOUNTED DOOR CLOSERS

A. All closers for this project shall be the products of a single manufacturer for continuity of design and consideration of warranty. All door closers shall be mounted as to achieve the maximum degree of opening (trim permitting).

B. All closers to be heavy duty, surface-mounted, fully hydraulic, rack and pinion action with high strength cast iron cylinder to provide control throughout the entire door opening cycle.

C. Size all closers in accordance with the manufacturer’s recommendations at the factory.

D. All closers to have adjustable spring power sizes 1 or 2 through 4 or 6 and separate tamper resistant, brass, non-critical regulating screw valves for closing speed, latching speed and back-check control as a standard feature unless specified otherwise.

E. All closer covers to be rectangular, full cover type of non-ferrous, non-corrosive material painted to match closer. Provide closer covers only if provided as a standard part of the door closer package.

F. Closers shall have heavy-duty arms. All closer arms shall be of sufficient length to accommodate the reveal depth and to insure proper installation. The hardware supplier shall provide all required brackets, spacers or filler plates as required by the manufacture for a proper and functional installation as part of their base bid.

G. Supply appropriate arm assembly for each closer so that closer body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the hardware sets.
1. All parallel arm mounted closers to be factory indexed to insure proper installation.
2. Furnish heavy-duty cold forged parallel arms for all parallel arm mounted closers.

H. Provide closers with special application and heavy-duty arms as specified in the hardware sets or as otherwise called for to insure a proper operating, long lasting opening. Drop plates and any additional brackets required for the proper installation of the door closer shall be included in the hardware supplier’s base bid.

I. Finish: Sprayed enamel finish shall match other hardware.

J. Provide and mount all door closers with sex bolts as provided by the manufacturer.

K. Closers shall be LCN 4041XP & 1461 series as specified (Refer to Hardware Sets 3.02).

2.08 DOOR STOPS AND HOLDERS

A. Door stops are to be furnished for every door leaf. Every door is to have a floor, wall, or an overhead stop.

B. Place doorstops in such a position that they permit maximum door swing, but do not present a hazard of obstruction. Furnish floor strikes for floor holders of proper height to engage holders of doors.

C. Where overhead stops and holders are specified, or otherwise required for proper door operation, they are to be heavy duty and of extruded brass, bronze or stainless steel with no plastic parts as specified**.** The General Contractor shall provide wood blocking in all stud walls specified and scheduled to receive wall stops.

D. Finish: Same as other hardware where available.

E. Floor and wall stops as listed in hardware sets. Equivalent products as manufactured by Ives, Hager, Glynn Johnson and Trimco are acceptable.

2.09 PUSH PLATES, DOOR PULLS, AND KICKPLATES

A. All push plates, door pull, kick plates and other miscellaneous hardware as listed in hardware sets. Equivalent products as manufactured by Ives, Rockwood, Glynn Johnson and Trimco are acceptable.

B. Kick plates to be 10 inches high and Mop plates to be 6 inches high, both by 2 inches or 1 inch less than door width (LDW) as specified. They are to be of 16-gauge thick stainless steel. For door with louvers or narrow bottom rails, kick plate height to be 1 inch less dimension shown from the bottom of the door to the bottom of the louver or glass.

C. Where required armor plates, edge guards and other protective hardware shall be supplied in sizes as scheduled in the hardware sets.

D. Finish: Same as other hardware where available.

2.10 FLUSH BOLTS AND COORDINATORS

A. Provide Flush bolts with Dust Proof Strikes as indicated in the individual hardware sets by Ives, Rockwood, Glynn Johnson and Trimco are acceptable. Finish shall match the adjacent hardware.

2.11 THRESHOLDS AND SEALS

A. Provide materials and finishes as listed in hardware sets. Equivalent product by National Guard Products, Zero, and Reese are acceptable. All thresholds must be in accordance with the requirements of the ADA and ANSI A117.1.

B. Provide thresholds with wood screws and plastic anchors. Supply all necessary anchoring devices for weather strip and sound seal.

C. Seals shall comply with requirements of UL10C. All thresholds, door bottoms and weather strip inserts shall be a silicone-based product as specified in 3.02 Hardware Sets.

D. Seals shall comply with the requirements of the Wood Door Manufacturer’s certification requirements.

2.12 FINISHES

A. Finishes for all hardware are as required in this specification and the hardware sets.

B. Special care is to be taken to make uniform the finish of all various manufactured items.

2.13 DOOR SILENCERS, KEY CABINET & STAFF TRAINING & SET-UP

A. Provide door silencers at all openings without gasket. Provide two- (2) each at each pair of doors and three- (3) or four- (4) each for each single door (coordinate with the frame manufacturer).

B. Provide a Lund key cabinet #1200 series (size shall be 150% larger than the total quantity of keys supplied for this project) for installation by the contractor as instructed by the Architect. The hardware supplier shall (On the project site) assist and train the South Texas College staff in the proper use of the key cabinet. This shall include the tagging of all keys, instructing the owner’s staff as to the proper use of the key cabinet and how they can best maintain the key system. The hardware supplier shall provide two- (2) copies of the floor plans that show the door number and key symbol at each door opening. One- (1) copy shall be placed in the key cabinet and one- (1) copy shall be turned over to the facilities locksmith. The hardware supplier shall send the Architect written confirmation that this has been completed. Confirmation shall include the date training occurred and names of all South Texas College staff members trained.

2.14 PROPRIETARY PRODUCTS

A. References to specific products are used to establish quality standards of utility and performance. Unless otherwise approved provide only the specified product.

B. All other materials, not specifically described, but required for a complete and proper finish hardware installation, are to be selected by the Contractor, subject to the approval of the Architect and South Texas College.

C. Architect and South Texas College reserve the right to approve all the substitutions proposed for this specification. All requests for substitution to be made prior to bid in accordance with Division 1, General Requirements, and are to be in writing, hand delivered to the Architect. Two (2) copies of the manufacturer’s brochures and a physical sample of each item in the appropriate design and finish shall accompany requests for substitution.

PART 3 - EXECUTION

3.01 INSTALLATION AND SERVICE ITEMS OF FINISH HARDWARE

A. All finish hardware shall be installed by an experienced finish hardware installer with at least ten (10) years experience after a pre-installation meeting between the contractor, hardware Manufacturers representative, the hardware supplier, the hollow metal supplier and the wood door supplier. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.

B. The hardware supplier’s office and/or warehouse shall be located within a one hundred (125) mile radius of the project site as to better service the general contractor and South Texas College during this project.

C. Check hardware against the reviewed hardware schedule upon delivery. Store the hardware in a dry and secure location to protect against loss and damage.

D. Install finish hardware in accordance with approved hardware schedule and manufacturers’ printed instructions. Pre-fit hardware before finish is applied to door; remove and reinstall after finish is complete and dry. Install and adjust hardware so that parts operate smoothly, close tightly, and do not rattle.

E. Mortise and cutting to be done neatly, and evidence of cutting to be concealed in the finished work. Protect all Finish hardware from scratching or other damage.

F. The hardware supplier, general contractor, hardware installer & if possible a representative of the lock, exit device and closer manufacturers shall after three (3) months of South Texas College acceptance of the facility perform an on-site survey of the finish hardware. Any item of finish hardware found to be defective or out of adjustment shall be replaced or adjusted for the proper function and operation of the door assembly at the contractor’s, supplier’s and/or installer’s expense. The hardware supplier shall provide a written report of all affected items to the Architect and South Texas College (No Exceptions). The scheduled inspection date for the onsite inspection and adjustment of finish hardware shall be provided to the Architect as a part of the general contractor and hardware supplies close-out documentation for this project.

G. The hardware supplier shall supply the factory bitting list for the project to be supplied with the permanent cores.

H. The hardware supplier shall supply 20 each Primus level III full size IC cores (0-bitted) to be supplied with the permanent cores.

3.02 **HARDWARE SETS**
SPEXTRA: 470284

HARDWARE GROUP NO. 01 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
09 10 12 13 14

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 02 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
11

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC	689	LCN
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 03 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
05

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 04 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
04

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	OH STOP	410S	689	GLY
1	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 05 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
15

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 06 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
01 07 08

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 07 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
02

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	CONST LATCHING BOLT	FB62	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ENTRANCE LOCK	ND53TD SPA	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	OH STOP	410S	689	GLY
2	EA	SURFACE CLOSER	1461 HD FC	689	LCN
1	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER
1	EA	PUSH SIDE ASTRAGAL	905AA-DOOR HEIGHT	AA	ZER

HARDWARE GROUP NO. 08 - FIRE RATED 20 MINUTE
FOR USE ON MARK/DOOR #(S):
03

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA	626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC	689	LCN
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER

HARDWARE GROUP NO. 09 - FIRE RATED EXISTING DOOR & FRAME
FOR USE ON MARK/DOOR #(S):
16

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FIRE EXIT HARDWARE	99-L-F-17-EMB "PUSH"	628	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	GASKETING	8145SBK PSA-HEAD & JAMBS	BK	ZER
		BALANCE HARDWARE	RE-USE EXISTING		

HARDWARE GROUP NO. 10 - EXISTING DOOR & FRAME
FOR USE ON MARK/DOOR #(S):
17 18

EACH TO HAVE:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	BOTTOM RAIL	4" CLOSED TOP BRONZE PROVIDED BY OTHER		
	BALANCE HARDWARE	RE-USE EXISTING		

END OF SECTION

DIVISION 9 FINISHES
09 29 00 GYPSUM BOARD WALL CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Interior gypsum board

B. Related Sections include the following:
   1. Division 9 Section 09 90 00 Painting for primers applied to gypsum board surfaces.

1.2 SUBMITTALS

A. Product Data: For each type of product specified

B. Samples: For the following products:
   1. Textured Finishes: Manufacturer’s standard size for each textured finish indicated and on same backing indicated for Work.

C. Fire-Resistance Ratings: Provide gypsum drywall work with ratings indicated and conforming to assemblies tested and listed by recognized authorities.

1.3 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.4 PROJECT CONDITIONS

A. Comply with ASTM C 840 requirements or 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, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS.

2.1 CEILING SUPPORT MATERIALS:

A. MAIN RUNNERS: Steel; channels, hot or cold-rolled, size per ASTM C 754.

B. HANGER WIRE: ASTM A 641, soft, class 1 galv.

C. HAT-SHAPED FURRING CHANNELS: ASTM C 645.
   1. Where shown as "Resilient", provide manufacturer's special type designed to reduce sound transmission.

D. FURRING MEMBER: ASTM C 645; 25-gauge C-shaped studs.

E. DIRECT SUSPENSION SYSTEM: Zinc-coated or painted steel system of furring runners, furring tees and accessories designed for concealed support of screw- attached gypsum drywall ceilings.

2.2 WALL/PARTITION SUPPORT MATERIALS:

A. STUDS AND RUNNERS: ASTM C 645, 0.0179" base metal thickness unless otherwise indicated.

B. FURRING MEMBERS: ASTM C 645, 0.0179" base metal thickness, hat shaped.

2.3 DRYWALL MATERIALS

A. EXPOSED GYPSUM BOARD: ASTM C 36.
   1. Provide type X where indicated and where required in fire resistance rated assemblies.

B. LONG EDGES: Standard taper.

C. THICKNESS: 1/4, 1/2, 5/8" unless otherwise indicated. (refer to plans for sizes)

D. GYPSUM BACKING BOARD FOR MULTI-LAYER APPLICATIONS: ASTM C 442 or A 36.

E. WATER-RESISTANT GYPSUM BACKING BOARD: ASTM C 630.

F. EXTERIOR GYPSUM BOARD: ASTM C-1177.

2.4 TRIM ACCESSORIES

A. Provide mfr's. standard metal trim accessories of the beaded type with face flanges for concealment in joint compound except where semi- finishing or exposed type is indicated. Provide corner beads, L-type edge trim beads, U-type trim beads, special L-kerf edge trim-beads, and one piece control beads.

B. GYPSUM BOARD FASTENERS: Type recommended by gypsum board mfr., except as otherwise indicated.

C. JOINT TAPE: ASTM C 475, paper reinforcing tape.

D. JOINT COMPOUND: ASTM C 475, of the type indicated.

E. Provide vinyl-tape power for interior work.

F. Provide water-resistant type manufactured by United States Gypsum Co. for use with water-resistant backing board.

G. Do not bridge building expansion joints with support systems, frame both sides of joint with furring and other supports as indicated.

H. **WALL & CORNER GUARDS: Stainless steel: 1-1/2” x 1-1/2” x 5’ Tall, Install (glued and screwed) directly on top of wall base.**

2.5 WALL/PARTITION SUPPORTED SYSTEM

A. Install steel studs with bottom and top runners tracks anchored to substrates. Isolate system from building structure to prevent transfer of loading and deflection into metal support system, both vertically and horizontally.

B. Frame door and other openings with studs and runners and gauge, number and arrangement to comply with manufacturer's recommendations for size of opening, weight of doors and height and stud size, unless otherwise indicated.

C. Install supplementary framing, runners furring, blocking and bracing at openings and terminations in gypsum drywall and where required for support of other work which cannot be adequately supported on gypsum board alone.

PART 3 EXECUTION

3.1 DRYWALL INSTALLATION AND FINISHING

A. Install gypsum boards in lengths and directions which will minimize number of end joints, and avoid end joints in central area of ceilings. Install walls and partitions with exposed gypsum boards vertical, joints offset on opposite sides of partitions. Otherwise, install boards with edges perpendicular to supports, with end joints staggered over supports, except where recommended in a different arrangement by mfr.

B. Form control joints with 1/2" space between boards. Install acoustical sealant at base of space, and apply trim accessory at face.

3.2 ACOUSTICAL SEALANT

A. Where work is indicated as "sound retarding" or shown with an STC rating, apply acoustical sealant as recommended by mfr.

B. Screw gypsum board to wood supports.

C. Screw both layers to supports where double-layer work is indicated or otherwise required.

3.3 DRYWALL FINISHING

A. Except as otherwise indicated, apply joint tape and joint compound at joints (both directions) between gypsum boards, Apply compound at accessory flanges, penetrations fastener heads and surface defects.

B. Install compound in 3 coats (plus pre-fill of cracks where recommended by mfr.); sand after last 2 coats.

END OF SECTION

DIVISION 9 FINISHES
09300 CERAMIC TILE

PART 1 GENERAL

1.1 SUMMARY

A. This section include the following:
   1. Quarry Tile
   2. Setting Materials.

1.2 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A108.5, 2010 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   2. ANSI A108.10, 2010 - Specifications for Installation of Grout in Tilework.
   3. ANSI A118.1, 2012 - Standard Specification for Dry-Set Portland Cement Mortar.
   4. ANSI A118.4, 2012 - Latex-Portland Cement Mortar.
   5. ANSI A118.6, 2016 - Standard Ceramic Tile Grouts.
   6. ANSI A118.7, 2016 - Polymer Modified Cement Grouts
   7. ANSI A137.1, 2017 - Specifications for Ceramic Tile.

B. ASTM International (ASTM):
   1. ASTM C150 - Standard Specification for Portland Cement.
   2. ASTM C 1028 - Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.

C. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2018.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
   1. Level Surfaces: Minimum of 0.6 (Wet).
   2. Stair Treads: Minimum of 0.6 (Wet).
   3. Ramp Surfaces: Minimum of 0.8 (Wet).

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 23.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Color charts illustrating full range of colors and patterns.

E. Selection Samples: Samples of actual tiles for selection.

F. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

G. Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.
   2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum two years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature during tiling and for a minimum of 7 days after completion.

1.9 EXTRA MATERIALS

A. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer
   1. Tile
      a. Interceramic
      b. Or approved equal
   2. Mortar, Grout and Adhesive Manufacturers
      a. Mapei Corporation
      b. Laticrete
      c. Or approved equal

B. Requests for substitutions will be considered in accordance with provisions of Section

01 10 00, Item 1.18 and 1.29.

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
   1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
   2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
   3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

B. Unglazed Quarry Tile: **(<u>for kitchen floor and base</u>)**: Refer to Room Finish Schedule on Sheet G5.1 for locations.
   1. Size and Shapes: 6 inches by 6 inches, nominal, and all shapes needed for round top cove base, including corners
   2. Surface Finish: Plain.
   3. Moisture Absorption: Less than 3 percent.
   4. Color: **505 Plaza Gray by Interceramic or approved equal**

C. Wall Glazed Tile:
   1. Product: IC Brites Semi-Gloss Wall Tile by Interceramic or approved equal
   2. Moisture Absorption: Less than .01 percent to less than 20 percent.
   3. Size and Shape: 6” square, nominal.
   4. Trim Units: Cement Bullnose, Cove Base, Cove Base Corner, Fabric Bullnose, Grooved Bullnose, Jolly shapes in sizes coordinated with field tile shapes.
   5. Color: As selected from the manufacturers standard colors.

1.2 SETTING MATERIALS

A. Mortar Bond Coat Materials:
   1. Dry-Set Portland Cement type: Modified thin-set to meet ANSI A118.1.
   2. Latex-Portland Cement type: ANSI A118.4.

B. Standard Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.6; color as selected from manufacturer’s standard colors during submittals phase. **N/A**

C. **Industrial Grade Epoxy Grout (<u>at all quarry tile</u>)**: 100 percent solids, water cleanable with high chemical and stain resistance, complying with ANSI A118.3 and ISO 13007 RG; MAPEI "Kerapoxy IEG" **OR** Laticrete “SpectraLOCK 2000 IG”.

PART 2 EXECUTION

2.1 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

2.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

2.3 INSTALLATION – GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
1. Sealing tile joints is work of this section.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

N. METAL EDGE STRIPS: Stainless steel or zinc alloy, 1/8" wide at top edge by Schlüter® Systems or approved equal.

1. Provide at exposed edge of tile meeting carpet, wood, or resilient flooring, unless otherwise indicated.
2. Provide type 304 stainless steel ADA compliant transition strips at edge of quarry tile transitioning into any type of flooring to provide a smooth transition, at all areas required. Description: profile with sloped exposed surface; height as required by T.A.S. Secure units to the substrate, complying with the edge strip manufacturer’s recommendations.

2.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over exterior concrete substrates, install in accordance with TCA Handbook Method F102, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

C. Over wood substrates, install in accordance with TCA Handbook Method F142, with standard grout, unless otherwise indicated.
   1. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F143.

2.5 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.
   3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

C. Over wood substrates, install in accordance with TCA Handbook method F141, with standard grout, unless otherwise indicated.

D. Cleavage Membrane: Lap edges and ends.

E. Waterproofing Membrane: Install as specified in ANSI A108.13.

F. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

2.6 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.

B. Over cementitious backer units install in accordance with TCA Handbook Method W223, organic adhesive.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
   1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
   2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.

D. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

E. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.

F. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

2.7 CLEANING

A. Clean tile in accordance with applicable ANSI standard for type of tile and method of installation used and manufacturer's instructions.

2.8 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. **Cover floors with kraft paper and protect from dirt and residue from other trades.**

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

END OF SECTION

DIVISION 9 FINISHES
09 51 13 SUSPENDED ACOUSTICAL CEILING
(Non-asbestos products)

PART 1 GENERAL

1.1 SUMMARY

A. This section includes Acoustical Panel Ceilings installed with exposed suspension systems.

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Section 09 29 00 Gypsum Board Wall Construction
   2. Division 15 HVAC
   2. Division 16 Electrical

1.2 REFERENCES

A. ASTM C423 – *Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method*

B. ASTM C635 – *Standard Specification for Metal Suspension Systems for Acoustic Tile and Lay-in Panel Ceilings*

C. ASTM C636 – *Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings*

D. ASTM E84 – *Test Method for Surface Burning Characteristics of Building Materials*

E. ASTM E119 – *Fire Test of Building Construction and Materials*

F. ASTM E1264 – *Classification for Acoustic Ceiling Products*

G. ISO 11654 – *Sound Absorbers for Use in Buildings – Rating of Sound Absorption*

1.3 SUBMITTALS

A. Product Data
   1. Submit manufacturer's published technical information for each product indicated.

B. Shop Drawings
   1. Submit reflected ceiling plans drawn to scale prescribed by Architect
      a. Include coordinated penetrations and ceiling-mounted items
      b. Include any necessary details or drawings from the manufacturer regarding recommended installation.

C. Samples
   1. Submit representative manufacturer's 6 inch square samples of each panel indicated
   2. Submit representative manufacturer's set of 12 inch long samples of exposed suspension system members, including moldings for each suspension member indicated.

D. Certifications
   1. Provide manufacturer's written certification that products submitted meet or exceed all specified requirements
   2. Provide laboratory reports that certify compliance with specified tests

1.1 QUALITY ASSURANCE

A. Source Limitations

1. Acoustic Ceiling Panel
    a. Obtain each type through one source from a single manufacturer
2. Suspension System
    a. Obtain each type through one source from a single manufacturer

B. Installer Qualifications
1. Must be experienced in the installation of systems similar to those specified herein.

C. Surface Burning Characteristics
1. ASTM E1264
    a. Class A
2. ASTM E84
    a. Flame spread of 25 or less
    b. Smoke developed of 50 or less
3. Fire Resistance Rating: Test in accordance with ASTM E199, UL Classified and listed in “UL Fire Resistance Directory”
    a. Refer to Fire Resistance Directory for specified UL Design Number and related assembly constructed data
    b. Consult with authorities having jurisdiction for requirements to achieve an acceptable fire resistance rating for a particular fire resistance assembly

1.2 DELIVERY, STORAGE AND HANDLING

A. Delivery of acoustic ceiling products will be in the original unopened packages with the manufacturer’s label intact.

B. Handling and storage should be in accordance with the manufacturer’s Material Safety Data Sheets (MSDS).

C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

D. Individual panels should be handled carefully to avoid damage

1.3 PROJECT CONDITIONS

A. Environmental Limitations
1. Install acoustic panels only in conditions that are within the manufacturer’s published limits for temperature and humidity.
2. Areas receiving ceiling panels should be free of construction debris and dust.
3. Mechanical, sprinkler and electrical trades shall have completed their work above the ceiling structure prior to commencement of the ceiling panel installation.

1.4 COORDINATION

A. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, components (if any) and partition system (if any).

1.5 EXTRA MATERIALS

A. Provide extra materials in the manufacturer’s unopened packaging, with the manufacturer’s label intact, as detailed below
1. Acoustic Panels – Minimum [5%] of each type installed

2. Suspension System Components – Minimum [5%] of each type installed

B. Package materials in protective covering and identify with appropriate labels.

C. Deliver extra materials to Owner’s representative.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. USG Corporation
B. Armstrong World Industries, Inc.
C. CertainTeed Ceilings

2.2 ACOUSTIC CEILING UNITS:

A. Acoustical Ceiling panels: Unless otherwise specified in room finish schedule or reflected ceiling plan, Products which may be incorporated in the Work include, but are not limited to, the following:

1. Non-Fire-rated Ceiling Panels – Water felted, Mineral based panel with Painted Finish and Perforated and Fissured Pattern, Humiguard Plus performance for humidity and mold resistance, Non-Fire-Resistance Rated:
   a. “Radar ClimaPlus” # 2220 USG Interiors, Inc.
   b. “Fine Fissured” # 1732 Armstrong World Industries, Inc.
   c. “Fine Fissured” # HHF-154 CertainTeed

2. Fire rated Ceiling Panel – Water felted, Mineral based panel with Painted Finish and Perforated and Fissured Pattern, Humiguard Plus performance for humidity and mold resistance, Fire Resistance Rated:
   a. “Radar ClimaPlus” # 2225 USG Interiors, Inc.
   b. “Fire Guard Fine Fissured” #1833 Armstrong World Industries, Inc.
   c. “Protectone Fine Fissured” #HHF-154 CertainTeed Ceilings

3. Non-Perforated Ceiling Panel – Mineral fiber composite with scrubbable factory applied vinyl plastic finish.
   d. “Vinyl Rock # 1142-CRF-1, CertainTeed Ceilings
   e. “Clima Plus” # 3260, USG Interiors, Inc.
   f. “Clean Room FL # 1715, Armstrong World Industries, Inc.

B. Manufacturers: Subject to compliance with requirements, Provide products by one of the following:

1. Non-Fire-Resistance-Rated and Acoustical Fire Rated Steel Suspension Systems:
   a. Armstrong World Industries, Inc.
   b. USG Interiors, Inc.
   c. CertainTeed Ceilings
   d. Chicago Metallic Corporation

2. Edge Moldings:
   a. Armstrong World Industries, Inc.
   b. USG Interiors, Inc.
   c. CertainTeed Ceilings
   d. Chicago Metallic Corporation

2.2 CEILING PANELS, GENERAL

A. Standard for ceiling Panels: Provide manufacturer’s standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to 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 15-3/4 inches away from the test surface per ASTM E 795.

B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.3 FIRE RATED AND NON FIRE RATED CEILING PANELS

A. Type, Form, and Finish: Provide Type III, Form 1 units per ASTM E 1264 with painted finish that comply with pattern and other requirements indicated.

B. Fine Fissured Pattern: Units matching pattern indicated by reference to manufacturer’s standard pattern designations, with other characteristics as follows:
   1. Color/Light Reflectance Coefficient: White/LR 0.83
   2. Color: White
   3. Noise Reduction Coefficient: NRC 0.55
   4. Ceiling Attenuation Class: CAC 0.33
   5. Edge Detail: Square
   6. Size: 24 inches by 24 inches by 5/8 inch

2.4 NON PERFORATED CEILING PANELS

A. Type, Form, and Finish: Provide Type X, (high density composition with scrubbable finish) per ASTM E 1264 with scrubbable factory applied vinyl.

B. Pattern: Plain Patter (non perforated)
   1. Color / Light Reflectance Coefficient: White/LR 0.79
   2. Noise Reduction Coefficient: NRC 0.15
   3. Edge Detail: Square
   4. Size: 24 inches by 24 inches by 5/8 inch

C. Provide at the following rooms: **Kitchen H132, Laundry Room H135, Baking Lab H130, Wash Room H131.** Refer to Room Finish Schedule.

2.6 METAL SUSPENSION SYSTEMS

A. Standard for Metal Suspension Systems: Provide manufacturer’s standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer’s standard factory applied finish for type pf system indicated.
   1. High Humidity Finish: Comply with ASTM C 635 requirements for “Coating Classification for Severe Environment Performance” where high humidity finishes are indicated. Aluminum Capped Grid, Fire rated, Intermediate Duty, White, at the following rooms: **Kitchen H132, Laundry Room H135, Baking Lab H130, Wash Room H131.**

C. Attachment Devices: Size for 5 times design

D. Secure to building structure, with hangers spaces 4'-0" along supported members.

E. Metal Direct-Hung Suspension Systems: Direct-hung systems, roll-formed from prefinished cold-rolled steel sheet, with hanger wire, attachment devices and edge moldings and trim.

F. Non-Fire Resistance-Rated Exposed Single Web Steel Suspension System with 15/16" Wide

G. Fire Resistance Rated Exposed Double Steel System with 15/16" Wide Exposed Faces: at all halls.

PART 3 EXECUTION

3.1 EXAMINATION

A. Ascertain acceptability of substrates and building conditions under which the ceiling system is to be installed. Do not proceed with the installation until any and all unacceptable conditions have been rectified.

3.2 PREPARATION

A. Unless otherwise directed by the reflected ceiling plan, measure the space in which the ceiling system is to be installed and establish a layout that balances border widths at opposite ends of the ceiling.

B. When possible, coordinate the ceiling system layout to avoid the use of less than half width panels at the perimeter.

3.3 INSTALLATION

A. Install the ceiling system in accordance with the following:
   1. Manufacturer’s printed instructions
   2. ASTM C636
   3. Ceilings & Interior Systems Construction Association (CISCA) recommendations
   4. Applicable local code requirements
   5. Approved shop drawings
   6. Tolerance: 1/8" in 12' - 0" level tolerance
   7. Pattern: One-way, align joints.
   8. Edge Moldings: Secure to substrate with screw anchors spaced 16" o.c. Miter corner joints.
   9. Cope exposed edges of intersecting exposed suspension members to produce flush intersections.
   10. Install acoustical tile with spline (or suspension flange) or tongue and groove at each joint.
   11. Place compression springs 12" o.c. in edge moldings of suspended tile systems.
   12. Cement acoustical tile to dry substrates to comply with manufacturer's instructions.

B. Access: Downward, with sizes for modules formed by main runners and cross tees and for initial direct access openings as indicated.

3.4 MAINTENANCE

A. Replace any and all damaged ceiling system components

B. Clean any and all exposed surfaces in accordance with the manufacturer’s printed instructions. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

DIVISION 9 FINISHES
09 65 16 RESILIENT SHEET FLOORING & WALL BASE
(Non-asbestos products)

PART 1 GENERAL

1.01 THIS SECTION INCLUDES

A. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

1.03 RELATED SECTIONS

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.
B. Division 3 Concrete; not the work of this section.
C. Division 6 Wood and Plastics; not the work of this section.
D. Division 7 Thermal and Moisture Protection; not the work of this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Select an installer who is competent in the installation of resilient sheet flooring using heat welded seams.
B. If required, provide type of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
   a. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
   b. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.05 SUBMITTALS

A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of "Mannington’s Professional Installation Guide,") for flooring and accessories.
B. Submit the manufacturer's standard samples showing the required colors for flooring and welding rods, and applicable accessories.
C. Submit a copy of the manufacturer’s recommended maintenance procedures for flooring and accessories.
D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.06 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store

flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 85ºF (29ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Provide Mannington Mills, Inc. resilient vinyl sheet flooring BioSpec SR in [color selected from the range currently available], 6’ 6” wide, having a nominal total thickness of .080 in. (2.0 mm). The vinyl wear surface shall be composed of polyvinyl chloride resin, plasticizers, stabilizers, fillers, and pigments consisting of through-grain vinyl chip visual with color and pattern detail dispersed uniformly throughout the entire thickness. Vinyl sheet flooring shall conform to the requirements of ASTM F 1913.
   1. Static Load (ASTM F970 mod), Passes - 2,000 PSI; Residual Indentation ≤ 0.005

B. Vinyl sheet flooring shall have one of the following topical wear layers with minimum 5 year warranty:
   1. Quantum Guard HP wear layer composed of a urethane aluminum oxide topcoat cured by an ultraviolet process. The aluminum oxide wear layer shall have a rating of 9 on the MOH (Hardness Scale).
   2. Quantum Guard HP wear layer with a patent-pending two-part wear layer and aluminum oxide infused top coat cured by ultraviolet process.

C. Environmental: Flooring must be FloorScore certified. Flooring must be made in the USA.

NO SUBSTITUTIONS

2.02 WALL BASE MATERIALS

A. For top set wall base: Provide Mannington Commercial - 1/8 in. (3.2 mm) thick, 4 in. (10.16 cm) high wall base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 2 - Layered, Style B – Cove with MR-101 Installation Adhesive.
   1. Apply wall base in lengths as long as practicable to walls, columns, and all permanent fixtures where indicated.
   2. On masonry or other irregular surfaces, fill voids behind base and along top and bottom edges with manufacturer's recommended adhesive filler.
   3. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   4. Do not scratch wall base during installation.
   5. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer’s recommended adhesive filler material.
   6. Provide Owner with two rolls or cartons of wall base for future use.
   7. Provide Amtico **373 Adhesive** under the flooring. Wall Base Adhesive at the wall base as recommended by manufacturer.

2.03 ADHESIVES

A. Provide Mannington V-82 Acrylic Flooring Adhesive under the flooring.
B. Provide MCS-42 Seam Sealer as produced by the manufacturer of the resilient flooring and intended for welding of seams. Weld rod color shall be compatible with field color of flooring or as selected by Architect to contrast with field color of flooring. Color selected from the range currently available.
C. Provide MT-800 Seam Sealer, if needed, to chemically weld product to surrounding broadloom carpet materials.

2.04 ACCESSORIES

A. Resilient sheet goods must have the ability to be chemically welded to adjoining broadloom carpet materials.
B. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Portland cement-based latex underlayment or patch and skim coat as recommended by the resilient flooring manufacturer.
C. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
D. Provide transition / reducing strips tapered to meet abutting materials.
E. Provide threshold of thickness and width as shown on the drawings.
F. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
G. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with portland cement-based latex underlayment or patch and skim coat as recommended by the flooring manufacturer.
B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the

compound manufacturer's recommendations for flooring. Avoid organic solvents.

C. Perform subfloor Calcium Chloride Tests (and Bond Tests) as described in "Mannington's Professional Installation Guide," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.
D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.03 INSTALLATION OF FLOORING

A. Install flooring in strict accordance with the manufacturer's written instructions.
B. Install flooring before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
E. Chemically weld LVT to adjoining broadloom carpet materials (Mannington Integra HP). Chemical welding carpet to sheet vinyl: Mannington's seam sealer MT-800 must be used to chemically weld Integra HP Backing to commercial sheet vinyl per manufacturer's instructions.
F. For installation of wall base:
    1. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
G. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.04 INSTALLATION OF ACCESSORIES

A. Fill voids with plastic filler along the top edge of the resilient wall base on masonry surfaces or other similar irregular substrates.
B. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
C. Provide type 304 stainless steel ADA compliant transition strips at edge of quarry tile transitioning into sheet flooring to provide a smooth transition, at all areas required. Description: profile with sloped exposed surface; height as required by T.A.S. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.05 CLEANING AND PROTECTION

A. Perform initial maintenance according to the latest edition of the manufacturer's maintenance and warranty literature.
B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

DIVISION 9 FINISHES
09 90 00 PAINTS & COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior and Exterior paints and coatings systems including: paint, stains, transparent coatings, and opaque finishes

1.2 RELATED SECTIONS

A. Section 06 20 00 – Finish Carpentry

B. Section 07 92 00 – Joint Sealants

1.3 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning

B. SSPC-SP 2 - Hand Tool Cleaning

C. SSPC-SP 3 - Power Tool Cleaning

D. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete

E. EPA-Method 24

F. OTC-Regulation No.41

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 23, Shop Drawings.

B. Product Data: Manufacturer's data sheets on each paint and coating product should include:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specification
   4. Storage and handling requirements and recommendations
   5. Application methods
   6. Cautions

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufactures color samples available.

D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

E. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/ supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/ color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning, and color samples of each color and finish used.

1.5 MOCK-UP

Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of painting on the project.

A. Finish surfaces for verification of products, colors, & sheens
B. Finish area designated by Architect
C. Provide samples that designate prime & finish coats
D. Do not proceed with remaining work until the Architect approves the mock-up samples

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer’s name, label, and the following list of information:

1. Product name, and type (description)
2. Application & use instructions
3. Surface preparation
4. VOC content
5. Environmental issues
6. Batch date
7. Color number

B Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction. Store materials in an area that is within the acceptable temperature range, per manufacturers instructions. Protect from freezing.

C Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. All materials used under painting contract shall be manufactured by The Sherwin Williams Company, or approved equal products of the following manufacturer, and shall be delivered to the job site in the original sealed containers.
    1. Sherwin Williams
    2. Pratt & Lambert
    3. Benjamin Moore

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 10 00 Summary of Work. When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

2.2 COLORS AND SAMPLES

A. Paint colors shall be selected by Architect. The Architect will furnish the painting contractor with color chips and a painting schedule showing where the various colors will go. Before any work is done, the contractor will then prepare color and texture samples on the job for the architect’s approval.

2.3 SCOPE OF WORK

A. The work done by the Painting Contractor shall include the Furnishings of all material, labor, tools and equipment required to complete the surface preparation, the painting, and the finishing of the building(s), as specified herein.

B. See drawings and schedules for type and location of various surfaces requiring paint or finishing.

C. Field painting will not be required on items specified to be completely finished at factory or any non-ferrous metals, unless specifically designated.

D. Do not include prime coats on ferrous non-structural metal delivered with prime or shop coats, already applied. However, all abrasions on such prime coats shall be touched up with primers.

2.4 WORKMANSHIP AND APPLICATION

A. All work shall be done in a workmanlike manner by skilled mechanics and executed in accordance with manufacturer’s printed instructions.

B. All materials shall be properly applied, and shall be free from runs or sags.

C. No exterior paint shall be applied in temp. below 50 Deg F. and all surfaces shall be thoroughly dry. Follow manufacturer’s printed recommendations for drying time before succeeding coats maybe applied.

D. No interior painting or finishing shall be permitted until the Architect so authorizes. Follow manufacturer’s printed recommendations for drying time before succeeding coats may be applied.

E. Varnishes and enamels shall be lightly sanded and then dusted before succeeding coats may be applied.

F. Paint one coat on the top and bottom edges of all doors, both metal and wood after doors have been fitted.

2.5 MATERIALS – GENERAL REQUIREMENTS

A. Paints and Coatings – General:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer’s instructions before

application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer’s product instructions.

B. Primers:
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as “best” by the manufacturer.

2.6 ACCESSORIES

A. Coating Application Accessories:
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A Do not begin application of coatings until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before proceeding.

B If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.2 SURFACE PREPARATION:

A. Proper product selection, surface preparation and application affect coating performance. Coating integrity and service life will be reduced because of improperly prepared surfaces. Selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

B. Selection of the proper method of surface preparation depends on the substrate, the environment, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

C. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

D. Preparing Block and Concrete Construction: Poured concrete or precast concrete surfaces should cure 60-90 days; block construction for 30-60 days before painting; upon prevailing climatic conditions. Before painting new concrete surfaces, the presence of form release agents and laitance deposits must be considered. In the event form oils or waxes are present, sand-blasting or a thorough washing with a detergent solution will be necessary to assure good adhesion.

E. Laitance must be removed by wirebrushing or Brush-Off Blast Cleaning. Poured concrete floors must be etched with a 10% solution of muriatic acid in water to dissolve the laitance and open the pores to allow the penetration of the coating. Caution: Wear rubber boots and gloves, work goggles and protective clothing.

F. Peeling and scaling, is often caused from painting over heavy chalk deposits that have not been properly removed. Remove this substance with high pressure spray equipment. If mildew is present, it can be killed and removed at the same time with a mildewcide solution.
   1. Efflorescence is a white deposit that frequently appears on exterior or interior masonry. To remove, first dampen the wall with water, then scrub the surface with a 10% solution of muriatic acid. Caution: Wear rubber boots and gloves, work goggles and protective clothing. After treatment, thoroughly flush the surface with clean water to remove all acid.

G. The painting contractor shall be wholly responsible for the finish of his work, and shall not commence any part of it until the surface is in proper condition. If painting contractor considers any surface unsuitable for proper finish of his work, he shall notify the Architect of this fact, and shall not apply any until the unsuitable surfaces have been made satisfactory, or the Architect has instructed him to proceed.

H. All knots or sappy spots shall be sealed before painting. After interior prime coats have been applied, all remaining necessary putting or spackling of nail holes, cracks and blemishes shall be done. All patch areas shall then be primed.

I. All metal surfaces shall be solvent cleaned to remove grease and oil before painting. Also, all metal surfaces shall have loose rust and scale removed before painting. New galvanized iron surfaces shall be primed with Sherwin Williams Pro-Cryl Metal Primer or approved equal after thorough cleaning as described above.

3.3 INSPECTION

A. Notify the Architect so that each coat of material is inspected and approved by the Architect before the application of each succeeding specified coat, otherwise no credit for the coat applied will be given, and the contractor automatically assumes responsibility to recoat the work in question.

3.4 PROTECTION OF PROPERTY

A. The painting contractor shall be responsible for the condition of building in his charge. He shall protect adjacent work and materials from soiling or damage as well as his own.

B. When work is completed, the painting contractor shall remove all surplus materials, scaffolds, etc. from the premises, and shall clean off all misplaced paint, varnish, etc. so as to leave the premises in good condition.

3.5 SCHEDULE

A. The following schedule is not intended to mention every particular item required to be painted, but it is intended to establish type and number of coats required on various materials

Interior Wood Trim 4 coats Stain Varnish Satin Finish

1. First Coat-Sherwin Williams Paste Wood Filler, if open grain wood.
2. Second Coat- Sherwin Williams Wood Classic Stain
3. Third Coat & Fourth Coats- Sherwin Williams Wood Classic Polyurethane Varnish (Satin)

Note: On Close Grain Wood, Paste wood filler may be eliminated.

Exterior wood, Gloss – 3 coats
1. First Coat Primer- Sherwin Williams A-100 Alkyd Exterior Primer
2. Second Coat- Sherwin Williams A-100 Gloss house paint
3. Third coat- Sherwin Williams A-100 Gloss House paint

Interior Dry Wall- 3 coats Eg-Shel Enamel
1. First Coat- Sherwin Williams Pro Mar 200 Latex Wall Primer
2. Second and Third Coats- Sherwin Williams Pro Mar 200 Zero VOC Latex Eg-Shel Enamel

Interior Metal- 2 coats- Eg-Shel Enamel
1. First Coat Shop Primed
2. Second Coat-Sherwin Williams Pro Industrial Pro-Cryl Universal Primer
3. Third Coat-Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss

Exterior Exposed Steel/ 3 coats
1. First Coat-Sherwin Williams Pro Industrial Pro-Cryl Universal Primer
2. Second Coat & Third Coats- Sherwin Williams Pro Industrial Urethane Alkyd Enamel

Interior Concrete Masonry Units
1. Prime Coat-Sherwin Williams Heavy Duty Block Filler or Loxon Block Surfacer
2. Second and Third Coat – Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss

Exterior Concrete Masonry Units
1. Prime Coat – Sherwin Williams Loxon XP Waterproofing Coating
2. Second and Third Coat – Sherwin Williams Loxon XP Waterproofing Coating

Interior & Exterior, Concrete Floors – 2 coats
If smooth hard-trowelled, should be etched with 10% solution of Muriatic Acid, then flushed with water and allowed to dry thoroughly.

1. Prime Coat – Sherwin Williams H&C Silicone Acrylic Concrete Stain
2. Second and Third Coat – Sherwin Williams H&C Silicone Acrylic Concrete Stain

Note: Do not use stain on previously painted surfaces, but in all cases provide two (2) new coats of paint.

Exterior Concrete Tilt-up Panels – 3 coats
1. First Coat- Sherwin Williams Loxon Exterior Primer or Loxon Conditioner
2. Second and Third coats- Sherwin Williams A-100 Flat or Ultracrete Textured Masonry Topcoat

Interior Concrete Tilt-up Panels – 3 coats
1. First Coat- Sherwin Williams Preprite Masonry Primer
2. Second and Third coats- Sherwin Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss

Exterior Stucco – 3 coats

1. First Coat- Sherwin Williams Loxon Exterior Primer
2. Second and Third coats- Sherwin Williams A-100 Flat

3.6 PAINT SCHEMES

A. PAINT COLORS:
   1. SW7049 Nuance: Wall field color
   2. SW STC Interstate Green: Door and window frames
   3. SW6983 Fully Purple
   4. SW6648 Kumquat
   5. SW6794 Flyway

3.7 EXTRA PAINT/VARNISHES

A. Provide owner with **one gallon** of each paint color used on the job. Also provide one quart of each type of varnish, sealer, stain, etc.

3.7 PREPARATION OF EXISTING MATERIALS

A. Clean existing walls and surfaces as per Sherwin Williams. Specifications and numbering system shown below.
   1. Masonry Walls: S-W3, or S-W4, and S-W12
      S-W6 C or D at interiors.
   2. Asbestos Siding: S-W2 and S-W12
   3. Concrete Floors and Walls: S-W5 (ASTM-D 4259, blast cleaning or ASTM-D4 260 acid etching).
   4. Dry Wall: S-W8 and S-W12
   5. Previously Coated Surfaces: S-W12
   6. Steel: S-W12 and S-W15
   7. Stucco: S-W22 and S-W12
   8. Exterior Wood: S-W23 and S-W12
   9. Interior Wood: S-W24 and S-W12
   10. Galvanized Metal: S-W10 and S-W13, S-W21

END OF SECTION

DIVISION 10 SPECIALTIES
10 14 40 SPECIALTY SIGNS

PART 1 GENERAL

1.1 SUBMITTALS

A. In addition to manufacturer's product data and installation instructions, submit the following:

B. Shop Drawings for each type of specialty sign required. Include plans, elevations, and sign lettering layout; show anchorages and accessory items.

C. Samples of each sign form and material showing finishes, colors, surface texture and qualities of manufacturer.

1.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following or an approved equal:
   1. Southwell Co., San Antonio, Tx. (A.D.A. tactile signage)
   2. Metallic Arts, 1-800-541-3200
   3. APCO Architectural Signs, Arlington, TX 1-817-483-0075
   4. Mohawk Signs Systems, 518-842-5303
   5. Bayuk Graphic Systems, 717-442-0274
   6. Intelligent Signage Inc., 302-762-4100

PART 2 PRODUCTS

2.1 INTERIOR SIGNAGE

A. Single-ply modified acrylic (matte non-glare): Engraving stock with face and core plies in contrasting colors, in finishes and color combinations as selected by Architect.
   1. Sign Size: Refer to sizes listed below.
      Beveled edges

B. Character Proportion. Letters and numbers on signs shall have width-to-height ratios and a stroke width-to-height ratios as per the new requirements for interior signage from the new ADA 2012.

C. Raised and Brailled Characters and Pictorial Symbols: Letters, numbers, symbols, or pictographs on signs shall be raised accompanied with Grade 2 Braille at least 1/32 inch (80 mm). Characters or symbols shall be at least 5/8 inch (16 mm) high. Indented characters or symbols shall have a stroke width of at least 1/4 inch (6mm).

D. Pictograms are to be located within a 6” vertical void. No characters or braille can be located within this field. Text descriptors are to be located directly below the pictogram. Use standard International symbols.

2.2 SCHEDULE

A. Provide one door sign for each room unless otherwise indicated below where multiple signs will be needed for a particular room.

(NAME)	(QUANTITY)	(SIZE)
CULINARY ARTS DEPARTMENT	3	Match Existing
EXIT	3	“
H101 LAB	1	“
H130 BAKING LAB	2	“
H131 WASH ROOM	1	“
H132 KITCHEN	2	“
H134 STORAGE	1	“
H135 LAUNDRY ROOM	1	“
H136 COOLER	1	“
H137 FREEZER	1	“
H138 STORAGE	2	“
H149 KITCHEN	1	“
H151 OFFICE	1	“
H152 OFFICE	1	“
H153 STORAGE	1	“
H154 OFFICE	1	“
H155 OFFICE	1	“
H116A OFFICE	1	“
H116B STORAGE	1	“
H116C OFFICE	1	“
H116D OFFICE	1	“
H127A STORAGE	1	“
H127B STORAGE	1	“

NOTE: ROOM NAMES ARE SUBJECT TO CHANGE

SAMPLE SIGNS

VERIFY TO MATCH EXISTING SIGNAGE COLORS AND STYLE

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate sign units and accessories where shown and scheduled, using mounting method of the type described and to comply with manufacturer's instructions. Install sign units level, plumb and at the height indicated.

B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Screw Mounted: Install with (4) 1" S.S. screws (provide inserts where required) one at each corner of sign.
2. Door signs to be mounted on glass shall have a dummy plate OR film on the back to conceal adhesive.

C. Mounting Height and Location. Room identification signs shall be mounted on the wall surface on the handle side of doors at approximately 60 inches (152 cm) above the floor and within 8 inches (20 cm) from the inside edge of the door frame. Where it is appropriate for tactile signage to be used for purposes other than room or space identification, the characters and symbols shall be placed to the left of the feature to be identified.

END OF SECTION

DIVISION 10 SPECIALITIES
10 44 16 FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

A. Perform all work required to complete the fire extinguishers indicated by the contract documents and furnish all supplementary items necessary for their proper installation.

B. This section includes the following:
   1. Fire Extinguishers
   2. Fire Extinguisher cabinets
   3. Mounting brackets

1.2 SUBMITTALS

A. Submit product data and finish samples for each type of product specified. For cabinets include rough-in dimensions, details showing mounting methods, relationship of box and trim to surrounding construction, door hardware, cabinets type and materials, trim style, door construction, panel style, and materials.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

B. UL Listed Products: Fire extinguishers UL listed and bear UL “Listing Mark” for type, rating, and classification of extinguisher.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Larsen's Manufacturing Co.
   2. J.L. Industries
   3. Seco Mfg., Inc.
   4. Potter Roemer
   5. Muckle Manufacturing, Division of Technico, Inc.
   6. American Specialties Inc.
   7. or approved equal

2.2 FIRE EXTINGUISHERS

A. Provide fire extinguishers, cabinet and accessories for each fire extinguisher.
   1. Multi-Purpose Dry Chemical Type: UL-rated 4-A: 60-B.C, 10 lb. nominal capacity, in aluminum container, color to match aluminum store front doors. (Re: drawings on door elevations)
   2. Class K fire extinguishers (designed for commercial kitchens) in aluminum cabinet.

B. Quantity: **Refer to floor plans for locations and quantities.**
   1. In addition to, provide one (1) fire extinguisher at each mezzanine (if any) and provide one (1) at each electrical room and mechanical room.

2.3 FIRE EXTINGUISHER CABINETS

A. Provide the following (manufacturer's standard accessories) accessories for each fire extinguisher.

B. Semi-Recessed Cabinet Type: Cabinet box partly recessed in wall. Cabinet cannot protrude more than 4”.

C. Bubble Type Door Style: One-piece molded plastic.

D. Fastener Bracket: Quick release fastener anchored to cabinet

E. Factory Finishing of Fire Extinguisher Cabinets: Comply with NAAMM "Metal Finishes Manual" to provide uniformly finished products.

F. Provide color as indicated, or if not indicated, as selected from manufacturer's standard colors. Cabinet color to match aluminum store front doors (Re: drawings on door elevations) Refer to plans for wall types (ie: gypsum or CMU).

2.4 MOUNTING BRACKETS

A. Provide brackets to prevent accidental dislodgement of extinguisher, or sizes required for type and capacity of extinguisher indicated in plated finish.
   1. Provide brackets for extinguishers not located in cabinets. i.e. Mechanical rooms, mezzanines

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation: In accordance with manufacturer's directions for type of mounting required at height and locations indicated, or if not indicated, to comply with applicable regulations of governing authorities.

B. Identify Fire Extinguisher in Cabinets with lettering spelling “FIRE EXTINGUISHER” printed on door by process indicated below, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

END OF SECTION

SECTION 11 4000
FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.2 WORK

A. Include the work specified, shown or reasonably inferable as part of Foodservice Equipment.

1.3 RELATED WORK IN OTHER SECTIONS

A. Slab depressions, reinforced concrete wearing bed and interior finished floor at Walk In Refrigerator/Freezer.

B. Concrete or masonry platforms with coved base at perimeter, for equipment.

C. Slab depressions for stainless steel drain trench liner/grate assemblies.

D. Corner guards.

E. Supply and exhaust fans for foodservice exhaust/supply hoods.

F. Roughing in and final connection of mechanical, electrical, and plumbing except indirect wastes built in to fabricated equipment.

1.4 QUALITY ASSURANCE

A. In addition to complying with applicable laws, statues, building codes and regulations of public authorities, comply with the following:
   01 National Sanitation Foundation (to bear label)
   02 National Electric Code
   03 Underwriters' Laboratories, Inc.
   04 Edison Testing Laboratories
   05 American Gas Association Laboratories
   06 National Fire Protection Association
   07 American Disabilities Act

1.5 SUBSTITUTIONS

A. Equipment items or components specified are intended to be the Basis of Bid. All other brands, including additional names listed as "Approved Equal" must conform with the specifications, size, accessories, etc. of the first- named brand and be subject to Paragraph C-03 of this Article.

B. Proposed Substitutions:
   01 Submitted no less than 14 calendar days prior to Bid Date.
   02 Submit with catalog data and/or manufacturer's shop details indicating all modifications required to conform with specified brand.

C. Substitutions with Prior Approval:
   01 Submitted on Bidder's letterhead attached to Proposal Form with each additive/deductive amount stipulated.

02 Owner reserves the right to accept or reject any or all substitution proposals before execution of contract.

03 Provide all engineering services required to make adjustments in space, utilities, etc. and pay all additional costs of utilities or construction that may occur due to the requirements of the accepted substitutions.

1.6 REUSED EXISTING EQUIPMENT

A. Utility disconnection and reconnection under Division 22 and 26.

B. Removal, transportation and replacement: Under this Section and scheduled with General Contractor.

C. Thoroughly clean inside and out, prior to relocation.

D. Review functional parts (doors, controls, heating elements, compressors.)

E. Existing equipment not scheduled for reuse is to be carefully removed.

1.7 WARRANTY

A. Provide a written warranty for a period of one year from the date of Substantial Completion, including extended four year replacement warranty on compressor bodies.

B. Components of equipment subject to replacement prior to one-year's use (such as steam cooker door gaskets) and those items which may fail due to improper or inadequate maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.

C. Refrigeration systems/equipment: One year free service available within twenty-four hours of notification.

1.8 INSTRUCTIONS TO BIDDERS

A. During Bidding: Contractor's or vendor's questions and comments pertaining to document clarity or intent will be responded to with addendum.

1.9 SUBMITTAL DATA

A. Special Requirements: The following are in addition to any general requirements given elsewhere in the Documents.

B. Procedures: Submit to the consultant (through the Architect) for preliminary review, one (1) electronic copy and/or at least two (2) prints/hardcopies, within four weeks after award of contract. Upon return of one (1) copy of data, submit the required number of copies to the Architect for processing. Partial submittals will not be accepted or processed.

C. Brochure:

01 Front and rear covers with labeled project name.

02 A separate flysheet for each component or item of equipment, indicating: item number, name, quantity, manufacturer, optional equipment, modifications, and utility requirements. An item of equipment or assembly containing more than one buy out sub-assembly or component shall have the secondary item listed in parenthesis beside the primary item name, i.e, Dishtable (Disposer).

03 Catalog specification sheet and/or manufacturer's drawing.

D. Plan and Rough in Drawings:
   01 1/4" scale drawing of fixed/non fixed Foodservice Equipment with itemized schedules.
   02 Separate drawing sheets of same size as contract drawings (Contract Drawings are not to be traced or reproduced).
   03 Electrical roughing in drawing.
   04 Plumbing/mechanical rough in drawing.
   05 Critical dimension drawings, sizing and locating the following conditions:
      a. Slab depressions or block outs.
      b. Concrete or masonry platforms.
      c. Pipe sleeves or roof jacks.
   06 Required information:
      a. All fixed and movable Foodservice Equipment shown on Contract Drawings.
      b. All general use and convenience utilities or services indicated, including those required or connected to equipment or devices not in this Section.
      c. All roughing in drawings fully dimensioned from finished room surface and/or established column lines to point of stub up through floor and stub out through wall or ceiling for all mechanical, electrical and plumbing services.

E. Shop Drawings:
   01 Sheet Size: Identical to Contract Drawings drawn at 3/4" scale for plan view and elevations, and 1-1/2" scale for sections and construction details.
   02 Included information: Item Number, name and quantity
   03 Construction details, sections and elevations to reflect requirements of the specifications and drawings.
   04 Adjacent walls, columns and equipment.
   05 Plumbing and electrical schematic drawings for equipment such as; conveyors, self-cleaning exhaust hood, exhaust hood fire protection systems, and fabricated fixtures with single electrical and/or plumbing connection.

1.10 OPERATIONS & MAINTENANCE MANUAL

A. Three copies bound in 1-1/2" hardback, three ring binders (as many volumes as required by scope of project) with same data as brochure at completion of installation.

B. Catalog specification sheet and/or manufacturer's shop drawings.

C. Manufacturer's operating/maintenance data including replacement parts information and price list. Provide the name, title and address of personnel at each respective manufacturer to be contacted for spare of replacement parts after guarantee period.

D. Furnish a list of all equipment and their respective local service agencies, indicating the address, telephone number and name of person to contact. Whenever possible, the service agencies selected shall be factory authorized for the equipment assigned.

1.11 VERIFICATION AND COORDINATION OF PROJECT/DATA

A. Refrigerated and Dry Storage Areas: Verify and coordinate dimensions to accommodate modular shelf sections. Notify Architect of variance between the Contract Documents and actual conditions.

B. Rough-In Drawings: Review for accuracy and completeness and notify Architect of deficiencies. Field-check locations. Cooperate and coordinate work with other sub-contractors.

C. Dimension Responsibility: Obtain actual or guaranteed measurements for proper fit of equipment. All dimensions given are approximate and are as accurate as can be determined

at this time. Field check all measurements and conditions at the building prior to fabrication or delivery of equipment and notify the Consultant of any deviation from the dimensions shown.

D. Scheduling to Fit Openings: Should it become necessary to schedule construction of walls or partitions prior to delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions.

E. Existing Equipment: Foodservice Contractor is responsible for verifying mechanical, electrical and plumbing characteristic of any existing equipment scheduled for re-use prior to submitting rough-in drawings. Foodservice Contractor to perform all tasks required to integrate/complete any new items with existing equipment and field conditions.

PART 2 - PRODUCTS

2.1 MATERIAL/COMPONENTS

A. Stainless steel sheets and/or shapes: 18-8, Type 304, polished to 180 grit No. 3 finish.
- 01 Stainless steel joints and seams: heli-arc welded, free of pits and flaws, ground smooth and polished to No. 4 finish.
- 02 The "grain" direction of horizontal stainless steel surfaces: longitudinal, including the back splash. The polishing procedure at right angle corners of fixtures shall provide a mitered appearance.

B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/ Paint Grip.
- 01 Galvanized iron joint and seams: arc welded, free of pits and flaws and ground smooth.
- 02 Galvanized sheets and/or shapes: washed with mineral spirits and primed with Rustoleum enamel in color selected by Architect.

C. Sound Deadening: Schnee Butyl Sealant 1/2" wide rope positioned continuously between all frame members and underside of stainless steel tabletops, overshelves and undershelves. Tighten stud bolts for maximum compression of sealant.

D. Plastic Laminates/Corian: color/pattern selected by Architect, in 1/16" thickness for flat surfaces; 1/32" thickness for radiused surfaces. Plastic laminates and adhesives must be approved by N.S.F. (Standard No. 35).

E. Identification Plates, Labels, Tags:
- 01 Prohibited Information: Names of suppliers, fabricators and contractors.
- 02 Required Information: function or purpose of such things as display light switches, food warmer controls, etc.

F. Plate Construction: engraved phenolic plastic, secure to equipment with epoxy cement or stainless steel screws. Furnish samples.

2.2 PLUMBING/MECHANICAL REQUIREMENTS

A. Plumbing fittings and components: furnished under this Section as follows. Components which are provided loose under this Section for field installation and connection by Division 22 are indicated by asterisk* or as indicated on details.
- 01* Control valves, water pressure regulators, vacuum breakers and chrome plated 90º elbows and nipples (no copper piping above splash) wherever required on Foodservice Equipment.
- 02* Faucets and drain fittings with connected overflows for all sinks.

03* Specialty Foodservice water fill faucets or hose assemblies indicated in drawings/specifications.
04* Wade No. W-10 Shock Stop shock absorbers for all Foodservice Equipment with quick opening or solenoid operated water valves.
05 Extensions of indirect waste originating with-in fabricated counters and/or equipment to open site drains. Drains: 1" minimum, Type "K" copper. All material and labor for final connection from equipment/sink tail pieces and anklets to open-sight drain over building floor sink or drain by Division 22.
06 All drainlines furnished with equipment: 1" thick insulation.
07 Piping brackets and/or supports beneath/within fabricated equipment.

B. Final Plumbing Connections Provisions:
01 Fabricated equipment containing components, fittings and/or devices indicated on Foodservice Connections Drawings to be connected to the building systems shall have each component, fitting or group thereof prepiped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.
02 Division 22 to supply all required piping/nipples, etc. to make complete installation. All gas lines connected to equipment with flexible hoses with quick connection action. (Quick-connects and steel reinforced supply hoses, by K.E.C.) Installed by Division 22.
03 Field assembled equipment (i.e., conveyor systems, exhaust hoods, conveyor type dishware machines, convection ovens, etc.) shall have plumbing components completely interconnected under this Section for final connection by Division 22 in arrangements indicated on Utility Connection Drawings by Division 22.
04 Back flow preventers, when required by local code, to be provided by Division 22.

C. Ducts and Vents:
01 Exhaust hoods, which are furred in to ceiling: 2" high duct collar for final connection to duct system.
02 Dishwash machine equipped with integral vent cowls or extended hoods: furnished with 18 gauge stainless steel seamless duct risers to 6" above finish ceiling for final connection. The duct: trimmed at ceiling with 16-gauge stainless steel angle flange with all corners welded.

2.3 ELECTRICAL REQUIREMENTS

A. Electrical fittings and components: furnished under this Section as follows. Components provided loose under this Section for field installation and connection under Division 26 are indicated with, by asterisk * or as indicated on detail. Coordinate foodservice equipment voltage and phase with building system.

B. Cord and caps:
01 Coordinate all Foodservice Equipment cord/caps with related receptacles.
02 All 120 volts "plug in" equipment shall have Type SO or SJO cord and plug with ground wire fastened to frame/body of item.
03 Cord lengths for fixed equipment: adjusted to eliminate loose-hanging excess.
04 All non-fixed plug in "buy-out" equipment shall have Hubbell configuration, ratings as required.

C. Switches and Controls:
01 Each motor driven appliance or electrically heated unit: equipped with control switch or starter as per Underwriters' Laboratories, Inc. with low voltage and overload protection.

D. Motors:
01 120-volt motors; manual tumbler type starter with thermal overload protection and interchangeable heating elements.

02 208 volt and 480 volt motors; magnetic starter with low voltage protection and one interchangeable overload relay per phase.

E. Receptacles and Switches:
01 Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies mounted in a metal box with stainless steel cover plate.
02 Load centers installed in/on fabricated equipment to have all fixture components pre-wired to load center with balanced phase loading. Load center ready for final connection by Division 26.

F. Final Electrical Connection Provisions:
01 Fabricated equipment containing electrically operated components and/or fittings indicated on Utility Connections Drawings to be direct connected, shall have each component, fitting or group thereof pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.
02 Fabricated equipment containing electrically operated components and/or devices indicated to have a circuit breaker load center shall have each component or device pre-wired to a separate circuit breaker for balanced phase loading and single final connection by Division 26.
03 Field assembled equipment (i.e., prefabricated walk in refrigerator/freezers, exhaust hoods), shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawing.

2.3 CUSTOM FABRICATED/ASSEMBLED UNITS

All fixtures within this Section are to be constructed by one manufacturer, of uniform design and finish.

A. Counter/Tabletops:
01 14-gauge stainless steel; all free edges turned down 180° on 1 5/8" radius. Free corners: rounded on 3/4" radius.
02 Marine edges: turned up 1/2" on 45° angle and turned down 2" with 3/4" tight hem at bottom.
03 Tops abutting high fixtures or walls: cove up 6" and slope back 1-1/2" at top on 45°angle; 2-1/2" where piping occurs. Turndown 1" at rear of splash and close ends to bottom of top turndown. Secure splash turndown to wall with 4" long 14 gauge Stainless Steel "zee" clip anchored to wall, 36" o.c.
04 Freestanding tables and all serving counter splash risers: turned back on 90° angles with 1" turndown at rear.
05 Brace tops with rigid-welded 1-1/2" x 1-1/2" x 1/8" galvanized steel angle frame at perimeter with cross bracing 2'-0" o.c. maximum. Provide 4" x 4" x 12 gauge steel triangular pads where leg socket welds to gusset. Paint entire frame with Rustoleum Primer. Angle frames: secured to underside of top surfaces with 1/4" studs welded 9" o.c. maximum with chrome-plated washer, lock washer, and cap nut. Studs: such length that cap nuts can be made-up tight, bringing top down snugly on an angle frame eliminating all vibrations or "oil-cannings."
06 All tops: 1-1/2" overhang at free sides of underframe or Closed Base Body.
07 All openings in tops shall have raised die formed edges, 3/16" high.
08 Reinforce all "built-in" counter equipment with framing members at perimeter of opening.

B. Sinks:
01 14-gauge stainless steel, all corners coved on 3/4" radius. Provide 1-1/2" wide double walled partitions with flat tops between compartments.
02 Exposed exterior panels of multiple compartment sinks are to be continuous. All gaps between compartments must have 14-gauge stainless steel filler panel welded, ground and polished.

03 Score and slope sink bottom 1/2" to drain. Set overflow centerline 1" below drainboard.
04 Fabricator may use at his option die stamped sink inserts of size and gauge specified.

C. Warewash Assembly:
01 Dishtable:
a. 14 gauge stainless steel; all free edges coved up 3" with 1-1/2" diameter rolled rim and bullnosed corners.
Two full length 1/8" high die-formed inverted "vee" ridges 10" o.c. at longitudinal centerline of top, with tapered ridge ends.
b. Edge of dishtables next to high fixtures or walls: coved up 10" and sloped back 1-1/2" on 45 degree angle; 2-1/2" where piping occurs. Turn down 1" at rear of splash and close ends to bottom of rolled rim. Secure splash turndown to wall with 4" long 14 gauge stainless steel "zee" clips anchored to wall, 36" o.c.
c. Slope tables 1/8" per foot, maintaining level crown and cove all corners on 3/4" radius.
d. Brace dishtables with 1" x 4" x 12 gauge stainless steel channels down centerline of top and between each pair of legs, with closed ends. Bracing: secured to underside of dishtable with 1/4" studs welded 6" o.c. maximum, with chrome plated washer, lock washer and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down in the channel members, eliminating all vibration and "oil-cannings."

D. Open Base Structures:
01 1-5/8" o.d. x 16 gauge seamless stainless steel tubing legs beveled at bottom. Fully weld 1-1/4" o.d. crossrails to legs.
02 Top of leg: inserted in Component Hardware No. A20-0206 socket fully welded to table frame or sink bottom gusset.
03 Round foot: Component Hardware No. A10-0852.
04 Table bases: maximum leg spacing of 5'-0" o.c.; dishtable and utensil wash counter bases at 5'-0" o.c.

E. Overshelves:
01 16 gauge stainless steel with free edges turned down 1" with 1/2" tight hem at bottom. ¾” radius at free corners.
02 Turn up 2" raw at walls or adjoining high fixtures with horizontal coved corner at rear. Round front corners of turnup on 3/4" radius.
03 Where shelf width exceeds 12" width, reinforce with 1/2" x 4" x 14 gauge stainless steel closed hat channel full length of shelf.
04 Wall mounted shelves: Keil Model No. 1508-1010-1251 or equal brackets 48" o.c. maximum set in 6" from ends. Coordinate wall backing with General Contractor at gypsum board walls or as required.
05 Freestanding shelves: Where turnup is required at free overshelves, the shelf is to be turned up 2" at ends, coved up at rear and hemmed tight to bottom of front turndown. Weld exposed corners.
06 Freestanding overshelves: Keil or equal cantilevered brackets at rear of table; Keil double cantilevered brackets at center of table. Posts for cantilevered overshelves are 1-5/8" o.d. x 16 gauge stainless steel secured to underframe, 4'-0" o.c. to underframe, 4'-0" o.c. Ends of shelves: Secured to adjacent wall/fixture or mounted on 1-1/4" diameter stainless steel posts.
07 Freestanding overshelves not on cantilevered brackets: 1-1/4" o.d. x 16 gauge stainless steel posts, each pair at 4'-0" o.c., maximum.

F Undershelves:

01 Open Base Structures: 16-gauge stainless steel turned down 1-1/2" tight hem at bottom. Notch all corners to fit tubular legs and weld from underside to completely fill gap; grind and polish. Cove up 2" at rear and/or ends adjacent to wall, columns, refrigerators, etc. The turnup is to be hemmed tight to bottom of turndown when turnup is specified for freestanding fixtures. Brace undershelf with 1" x 4" x 14 gauge stainless steel channel at longitudinal centerline and at each intermediate pair of legs.

02 Closed Base Fixtures: 16 gauge stainless steel turned down 1-1/2" at front. Front edge of bottom shelf: turned back and sealed to masonry platform or boxed for leg application. Center shelf has 3/4" tight hem.

a. Shelves: turn up square at ends (coved up at rear only) to the shelf above or counter top flanged out for attachment with no open spaces at interior.

b. All shelf partitions at exposed ends of cabinet bodies or interiors: free of exposed framing members.

c. Reinforce shelves with full-length 1" x 4" x 14 gauge stainless steel closed hat channel.

d. Unless otherwise noted, all undershelves are to be 22" deep, clear.

e. Weld the vertical seam of shelf turndown/turnup with face of body partition.

G. Shop/Field Joints:

01 Stainless steel tops: welded, ground and polished to No. 4 finish.

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

A. Supervision: Provide a competent foreman or supervisor who shall remain on the job during the entire installation.

B. Delivery: Foodservice Equipment excluding exhaust hoods, trench liners and walk-in coolers/freezers are not to be delivered and/or set in place until the following construction has been completed: kitchen floors prepped and cleaned, walls painted, ceiling installed and wiring pulled to junction boxes. (note 1. acid floor washes are not to be used on or near stainless or aluminum surfaces. 2. Walk-in doors are to remain open during concrete cure).

01 Assemble, square, level and make ready items for the final utilities connections.

02 Scribing: cut neatly around obstructions to provide sanitary conditions.

03 Where gaps occur between equipment, apply General Electric silicone construction sealant Series SE-1200 mastic or stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement and/or "zee" clips wherever possible to secure trim.

3.2 CLEAN AND ADJUST

A. Clean up and remove from the job site, all debris resulting from the work as the installation progresses.

B. Thoroughly clean and polish all Foodservice Equipment, in and out, ready for Owner's use prior to demonstration and final inspection.

C. Lubricate and adjust drawer slides, hinges, casters.

D. Clean and replace faucet aerators, water strainers.

E. Touch up damage to painted finishes.

F. Start up and check all refrigeration systems for at least 72 hours prior to acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

A. Carefully test, adjust and regulate all equipment in accordance with the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments and performance are in full compliance.

B. Provide the Owner and/or Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance.

3.4 FINAL INSPECTION

A. Final inspection will be made when the contractor will certify that he has completed his work; made a thorough review of the installation/operation of each item in the contract and found it to be in compliance with the construction documents.

B. The Foodservice Consultant's repetitive final inspection and all costs associated thereto, incurred due to the Contractor's failure to comply with the requirements of this Article, will be invoiced to this Contractor.

4.0 EQUIPMENT SCHEDULE

A. Provide regularly manufactured equipment components included in this Section with standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.

Item No. 01 - Washer **Quantity One (1)**

A. Existing, relocate.

Item No. 02 - Dryer **Quantity Two (2)**

A. One (1) existing, relocate.

B. One (1) by owner.

Item No. 03 - Three-Compartment Sink **Quantity One (1)**

A. One (1) three compartment sink assembly; size and shape as indicated on drawings.

B. 1-1/2" rolled rim at front and ends; 10" high splash where adjacent to wall.

C. Three (3) 1’-8” x 2”-2” x 1’-3” deep sink compartments.

D. Three (3) Component Hardware Model No. D53-7215, rotary drains with connected overflows and tailpiece.

E. Two (2) T & S Model No. B-0290, splash mount faucets. Provide with Model No. B-0230KIT, installation kit.

F. Open base construction.

G. Undershelf below drainboards.

H. One (1) full-length wall mounted overshelf.

Item No. 04 - Worktables **Quantity Four (4)**

A. Existing, to remain

Item No. 05 - Preparation Sink **Quantity One (1)**

A. One (1) preparation sink assembly; size and shape as indicated on drawings.

B. ½” marine edge at front; 10" high splash at wall.

C. Two (2) 2'-0" x 2'-2" x 1'-3" deep sink compartments. Weld ¼” stainless steel rods into sink corners for sink cover holders.

D. Two (2) Read Products “Richlite” ½” thick removable sink covers (with finger holes) at each sink. One (1)14 gauge stainless steel vertical sink cover rack mounted per drawings; refer to Elevations.

E. Two (2) Component Hardware Model No. D53-7215, rotary waste drains with connected overflow and tailpiece.

F. One (1) T & S Model No. B-0231-CR, splash mount faucet with B-230KIT, installation kit.

G. Open base construction.

H. Provide undershelf below drainboards.

I. One (1) wall mounted overshelf, length as indicated.

Item No. 06 - Exhaust Hood **Quantity One (1)**

A. Existing, to remain.

Item No. 07 - Convection Oven **Quantity One (1)**

A. Existing, relocate.

Item No. 08 - Electric Kettle **Quantity One (1)**

A. Future.

B. One (1) Groen Model No. DEE/4-40C, 40 gallon electric kettle.
01. 2" tangent draw-off valve.
02. Counter balanced hinged cover.
03. Pan carrier.
04. Kettle brush kit.
05. Bullet feet in front with rear feet flanged for bolting to floor with stainless steel fasteners.

C. One (1) T & S Model No. B-0610-CR with 018200-45, wall mount fill faucet. Mount on wall 44” A.F.F. with stainless steel bracket where indicated on drawings. Construct stainless steel wall bracket per Detail A, Sheet FS-7.

Item No. 09 - Six (6) Burner Range **Quantity One (1)**

A. Existing, relocate.

Item No. 10 - Number Not Used

Item No. 11 - Worktable **Quantity One (1)**

A. Existing, to remain.

Item No. 12 - Student Storage Shelving **Quantity One (1) Lot**

A. Existing, to remain.

Item No. 13 - One (1) Compartment Sink **Quantity One (1)**

A. One (1) Eagle Group Model No. 314-22-11, single compartment sink.
   01. One (1) 313920, splash mounted faucet.
   02 One (1) Component Hardware Model No. D53-7215, rotary drain with connected overflows and tailpiece.

Item No. 14 - Exhaust Hood **Quantity One (1)**

A. Existing, to remain.

Item No. 15 - Refrigerated Equipment Stand **Quantity One (1)**

A. One (1) Continental Model No. DL108G, refrigerated equipment stand.
   01. Electric condensate evaporator.
   02. Marine edge.
   03. Mount unit on 4” casters with brakes.
   04. Stainless steel exterior, interior, and back.
   05. Cord and plug.

Item No. 16 - Countertop Six (6) Burner Range **Quantity One (1)**

A. One (1) Imperial Model No. IHPA-6-36, countertop six (6) burner range. Install on Item No. 15 - Refrigerated Equipment Stand where indicated on drawings.
   01. Natural gas.
   02. ¾” rear gas connection with gas pressure regulator.
   03. One (1) T & S Model No. HG-4D-48SK, 48 inch long quick disconnect with swivels at each end with restraining device (installed in line by plumber).
   04. Mount on 4 inch stainless steel legs with adjustable feet.

Item No. 17 - Countertop Charbroiler **Quantity One (1)**

A. Existing, relocate.

Item No. 18 - Countertop Griddle **Quantity One (1)**

A. Existing, relocate.

Item No. 19 - Fryer w/Dump Station **Quantity One (1)**

A. Existing, relocate.

Item No. 20 - Ice Machine **Quantity One (1)**

A. Existing, relocate.

Item No. 21 - Fire Suppression System **Quantity One (1)**

A. One (1) Ansul Model No. R-102, automatic liquid chemical system with all components required by NFPA Pamphlet No. 96, installed in hood in accordance with manufacturer's recommendation. Provide duct and plenum protection to Item No. 06 - Existing Exhaust Hood, Item No. 14 - Existing Exhaust Hood and surface protection as required to cooking equipment below. Provide label at remote fire system pull identifying which hood fire suppression system is to protect.

B. Remote manual release in path of egress from protected exhaust hood area. Provide trim ring around pull.

C. Locate top of chemical cylinders as indicated on the drawings at ceiling level and install piping to hoods in a totally concealed manner. Any exposed piping and fittings shall be chrome plated or sleeved with stainless steel tubing. Exposed pipe threads in/above food zone are not acceptable.

D. Mechanical gas shut-off valve (installed in line by plumber).

Item No. 22 - Reach-In Refrigerator **Quantity One (1)**

A. Existing, relocate.

Item No. 23 - Worktable **Quantity One (1)**

A. One (1) worktable assembly; size and shape as indicated on drawings.

B. Turn free sides down 2" square; ¾” radius corners.

C. Two (2) drawer assemblies.

D. Open base construction.

E. Full length undershelf.

Item No. 24 - Heat Lamps **Quantity Three (3)**

A. Three (3) Hatco Model No. DLH-775-RR, heat lamps with remote switch. Mount switch where indicated on drawings.

B. Install where indicated on drawings.

Item No. 25 - Reach-In Freezer **Quantity One (1)**

A. Existing, relocate.

Item No. 26 - Exhaust Hood **Quantity One (1)**

A. One (1) Mod-u-Serve Air Systems Model No. W-cpb, 5'-0" deep exhaust hood. All welded 18-gauge stainless steel construction with insulated supply air plenum.
   01. Stainless steel baffle filters.
   02. Four (4) 48” recessed LED light fixtures with two (2) factory supplied lamps per fixture, to provide 50-foot candles on cooking surface.
   03. Provide Mod-u-Serve Model No. ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110º F.

04. Suspend from structure above ceiling, trim to ceiling with stainless steel closure panels.
05. Exhaust hood components and accessories shall be UL rated. Exhaust hood shall be fabricated in accordance with NSF requirements.
06. Stainless steel where exposed.
07. Continuous air plenum.
08. Provide double layer fire blanket.
09. Clearance requirement: Where any exterior surface of the hood is installed less than 18” from a combustible surface or penetrates a lay-in tile ceiling, provide where required the U-shaped 3” high S/S air space and also provide, where required, a double layer of an approved Fire Barrier Duct Wrap in a manner as prescribed by the manufacturer.

B. Install at 6'-10" A.F.F.

C. 18 gauge insulated stainless steel wall panel, full height from bottom of hood to top of coved base. Top of panel to be secured under hood.

Item No. 27 - Monitor **Quantity Two (2)**

A. Owner Furnished.

Item No. 28 - Four Burner Range **Quantity One (1)**

A. Existing, relocate.

Item No. 29 - Six (6) Burner Range **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) Imperial Model No. IHR-6-C, six (6) burner range.
01. Natural gas.
02. ¾” rear gas connection.
03. Gas pressure regulator.
04. Cap and cover manifold ends.
05. 17” high stainless steel flue riser.
06. Mount on casters with brakes.
07. One (1) T & S Model No. HG-4D-48SK, 48" long quick disconnect with swivels at each end with restraining device (installed in line by plumber).

Item No. 30 - Number Not Used

Item No. 31 - Convection Oven **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) Imperial Model No. ICVG-2, double deck convection oven.
01. Natural gas.
02. Provide stainless steel back panels.
03. Mount on casters with brakes.
04. Provide separate gas connections for top and bottom units and two (2) T & S Model No. HG-4D-48SK, 48" long quick disconnect with swivels at each end with restraining device (installed in line by plumber).

Item No. 32 - Convection Oven **Quantity One (1)**

A. Existing, relocate.

Item No. 33 - Fire Suppression System **Quantity One (1)**

A. One (1) Ansul Model No. R-102, automatic liquid chemical system with all components required by NFPA Pamphlet No. 96, installed in hood in accordance with manufacturer's recommendation. Provide duct and plenum protection to Item No. 26 - Exhaust Hood, and surface protection as required to cooking equipment below. Provide label at remote fire system pull identifying which hood fire suppression system is to protect.

B. Remote manual release in path of egress from protected exhaust hood area. Provide trim ring around pull.

C. Locate top of chemical cylinders as indicated on the drawings at ceiling level and install piping to hoods in a totally concealed manner. Any exposed piping and fittings shall be chrome plated or sleeved with stainless steel tubing. Exposed pipe threads in/above food zone are not acceptable.

D. Mechanical gas shut-off valve (installed in line by plumber).

Item No. 34 - 40-Quart Mixer **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) Hobart Model No. HL400, 40-quart mixer.
   01. Standard accessory package.
   02. VS9-12 front and back casing with S knife. Provide two (2) shredder plates (3/16” & 5/16”), one (1) grater plate and #12 plate holder.
   03. Rubber pads on feet.
   04. 30-quart stainless steel bowl.
   05. 30-quart type "B" flat beater, "D" wire whip, dough hook.
   06. 40/30-bowl scrapper.

Item No. 35 - Worktable **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) worktable assembly; size and shape as indicated on drawings.

C. Turn free sides down 2" square; ¾” radius corners.

D. Two (2) drawer assemblies.

E. Open base construction.

F. Full length undershelf.

G. One (1) wall mounted overshelf, length as indicated.

Item No. 36 - 40-Quart Mixer **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) Hobart Model No. HL400, 40-quart mixer.
   01. Standard accessory package.
   02. VS9-12 front and back casing with S knife. Provide two (2) shredder plates (3/16” & 5/16”), one (1) grater plate and #12 plate holder.
   03. Rubber pads on feet.

04. 30-quart stainless steel bowl.
05. 30-quart type "B" flat beater, "D" wire whip, dough hook.
06. 40/30-bowl scrapper.

Item No. 37 - Mobile Worktable **Quantity Eight (8)**

A. **Future Equipment, Owner Furnished**.

B. Eight (8) mobile worktable assemblies; size and shape as indicated on drawings.

C. Turn free sides down 2" square; ¾” radius corners.

D. Open base construction.

E. Full-length undershelf.

F. Mount on casters with brakes.

Item No. 38 - 5 Quart Mixer **Quantity Eight (8)**

A. **Future Equipment, Owner Furnished.**

A. Eight (8) Hobart Model No. N50, 5-quart mixers.
01. Stainless steel 5-quart bowl, beater, whip and hook.

Item No. 39 - Preparation Sink **Quantity One (1)**

A. **Future Equipment, Owner Furnished.**

B. One (1) preparation sink assembly; size and shape as indicated on drawings.

C. ½” marine edge at front; 10" high splash at wall.

D. Two (2) 2'-0" x 2'-2" x 1'-3" deep sink compartments. Weld ¼” stainless steel rods into sink corners for sink cover holders.

E. Two (2) Read Products “Richlite” ½” thick removable sink covers (with finger holes) at each sink. One (1)14 gauge stainless steel vertical sink cover rack mounted per drawings; refer to Elevations.

F. Two (2) Component Hardware Model No. D53-7215, rotary waste drains with connected overflow and tailpiece.

G. One (1) T & S Model No. B-0231-CR, splash mount faucet with B-230KIT, installation kit.

H. Open base construction.

I. Provide undershelf below drainboards.

END SECTION 11 40 00

TRINITY
MEP ENGINEERING

3533 Moreland Dr. Suite A | Weslaco, Texas 78596
P: 956.973.0500 | F:956.351.5750
www.trinitymep.com | Copyright 2019
Texas Registered Engineering Firm No. - F10362

9/12/19

DIVISION 21 – FIRE PROTECTION

21 13 13 WET-TYPE SPRINKLER SYSTEMS

DIVISION 22 – PLUMBING

22 01 00 SUMMARY OF PLUMBING WORK
22 05 01 COMMON PLUMBING REQUIREMENTS
22 05 29 HANGERS AND SUPPORTS FOR PLUMBING EQUIPMENT
22 05 53 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
22 07 19 PLUMBING PIPING INSULATION
22 11 16 DOMESTIC WATER PIPING
22 11 19 DOMESTIC WATER PIPING SPECIALTIES
22 13 13 FACILITY SANITARY SEWERS
22 13 19 FACILITY SANITARY SEWER SPECIALTIES
22 34 00 FUEL-FIRED DOMESTIC WATER HEATERS
22 42 00 PLUMBING FIXTURES

DIVISION 23 – HEATING VENTILATION & AIR CONDITIONING

23 00 00 HEATING, VENTILATION AND AIR-CONDITIONING (HVAC)
23 05 00 COMMON WORK RESULTS FOR HVAC
23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 05 63 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC
23 06 01 MECHANICAL IDENTIFICATION
23 07 13 DUCT INSULATION
23 07 19 HVAC PIPING INSULATION
23 26 00 CONDENSATE DRAIN PIPING
23 31 13 METAL DUCTS
23 33 00 HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) DUCT ACCESSORIES
23 33 46 FLEXIBLE DUCTS
23 34 23 CENTRIFUGAL FANS
23 37 13 DIFFUSERS, REGISTERS AND GRILLES

DIVISION 26/27/28 – ELECTRICAL

26 00 00 ELECTRICAL
26 01 20 OPERATIONS AND MAINTENANCE OF LOW-VOLTAGE ELECTRICAL DISTRIBUTION
26 05 00 COMMON WORK RESULTS FOR ELECTRICAL
26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 05 43 UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

TRINITY
MEP ENGINEERING

3533 Moreland Dr. Suite A | Weslaco, Texas 78596
P: 956.973.0500 | F:956.351.5750
www.trinitymep.com | Copyright 2019
Texas Registered Engineering Firm No. - F10362

26 09 23 LIGHTING CONTROL DEVICES
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 28 13 FUSES
26 28 16.16 ENCLOSED SWITCHES
26 51 00 INTERIOR LIGHTING

27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS
28 46 21.11 ADDRESSABLE FIRE-ALARM SYSTEMS

SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Furnish and install complete wet-pipe fire sprinkler system as specified in Contract Documents.

2. Furnish and install Firestop Penetration Systems for fire sprinkler system penetrations as described in Contract Documents.

1.2 REFERENCES

A. Association Publications:

1. Underwriters Laboratories, Inc.:

a. UL Directory B, 'Fire Protection Equipment Directory' (2011).

B. Reference Standards:

1. American National Standards Institute / American Society of Mechanical Engineers:

a. ANSI/ASME B1.20.1-1983(R2006), ‘Pipe Threads, General Purpose (Inch)’.

b. ANSI/ASME B16.1-2010, ‘Cast Iron Pipe Flanges and Flanged Fittings’.

c. ANSI/ASME B16.3-2011, ‘Malleable Iron Threaded Fittings: Classes 150 and 300’.

d. ANSI/ASME B16.4-2011, ‘Gray Iron Threaded Fittings, Classes 125 and 250’.

e. ANSI/ASME B16.5-2009, ‘Pipe Flanges and Flanged Fittings’.

2. American National Standards Institute / American Water Works Association:

a. ANSI/AWWA C606-11, ‘Grooved and Shouldered Joints’.

3. American National Standards Institute / American Welding Society:

a. ANSI/AWA B2.1/B2.1M-2009, ‘Specification for Welding Procedure and Performance Qualification’.

4. ASTM International:

a. ASTM A53/A53M-12, ‘Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless’.

b. ASTM A135/A135M-09, ‘Standard Specification for Electric-Resistance-Welded Steel Pipe’.

c. ASTM A234/A234M-11a, ‘Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service’.

d. ASTM A395/A395M-99(2009), ‘Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures’.

e. ASTM A536-84(2009), ‘Standard Specification for Ductile Iron Castings’.

f. ASTM A795/A795M-08, ‘Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use’.

5. National Fire Protection Association / American National Standards Institute:

a. NFPA 13: ‘Standard for the Installation of Sprinkler Systems’, (2010 Edition).

b. NFPA 24: ‘Installation of Private Fire Service Mains and their Appurtenances’, (2010 Edition).

c. NFPA 25: ‘Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems’, (2011 Edition).

d. NFPA 101: ‘Life Safety Code’, (2012 Edition).

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

a. Size sprinkler system by one of following methods:

1) Hydraulic calculation design method based on water supply evaluation performed at building site.

b. On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.

c. Submittal Procedure:

1) After award of Contract and before purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations to Architect and two sets to local jurisdiction having authority for fire prevention for review.

2) After integrating Architect's and AHJ's comments into drawings, licensed certified fire protection engineer of record who designed fire protection system

shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.

3) Submit stamped documents to Owner and to AHJ for fire prevention for final approval.

4) After final approval, submit four copies of approved stamped documents to Architect.

5) Failure of system to meet requirements of authority having jurisdiction and/or approved stamped construction documents shall be corrected at no additional cost to Owner.

B. Informational Submittals:

1. Qualification Statement:

a. Licensed fire protection engineers or fire protection system designer:

1) Licensed for area of Project.

2) Certified by NICET to level three minimum.

3) Provide Qualification documentation if requested by Architect or Owner.

b. Installer:

1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

a. Operations and Maintenance Data:

1) Maintenance and instructions.

a) List of system components used to indicate name and model of each item.

b) Manufacturer's maintenance instructions for each component installed in Project.

c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.

b. Warranty Documentation:

1) Include copies of required warranties.

c. Record Documentation:

1) Include copies of approved shop drawings.

2) Provide master index showing items included.

3) Provide name, address, and phone number of Architect, Architect's Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.

4) Provide operating instructions to include:

a) General description of fire protection system.

b) Step by step procedure to follow for shutting down system or putting system into operation.

5) Provide copy of system's above ground and below ground hydrostatic tests. Provide separate copies for Architect and Owner.

6) Provide copy of 'Contractor's Material and Testing Certificate for Above Ground Piping' NFPA 13, Figure 24.1 (2010 edition).

2. Inspection:

a. Provide Owner with latest version of NFPA 25.

D. Maintenance Material Submittals;

1. Extra Stock Materials:

a. Spare sprinkler heads in the quantity recommended by NFPA 13 selected in representative proportion to quantity used in Project and in accordance with NFPA 13 (Six (6) spare sprinkler heads minimum).

b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Unless noted otherwise, system shall conform to:

a. NFPA 13, 'Light & Ordinary Hazard Occupancies'.

b. NFPA 24, 'Service Mains and Their Appurtenances, Private'.

c. NFPA 25, 'Inspection, Testing, and Maintenance.

d. NFPA 101, 'Life Safety Code'.

e. Requirements of local water department and local authority having jurisdiction for fire protection.

f. Underwriters Laboratories Publication, UL Directory B, 'Fire Protection Equipment Directory', current edition at time of Pre-Bid Meeting.

g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.

h. Applicable rules, regulations, laws, and ordinances.

B. Qualifications:

1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:

a. Licensed for area of Project.

b. Minimum five (5) years experience in fire protection system installations.

c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

d. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.

e. Make complete inspection of installation.

f. Provide corrected record drawings to Owner with letter of acceptance.

g. Certify that installation is in accordance with Contract Documents.

h. Upon request, submit documentation.

2. Installer:

a. Licensed for area of Project.

b. Minimum five (5) years experience in fire protection system installations.

c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

d. Upon request, submit documentation.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:

    a. Croker Corp, Elmsford, NY www.croker.com.

    b. Gruvlock by Anvil International, Portsmouth, NH www.anvilintl.com.

    c. HO Trerice Company, Oak Park, MI www.hotco.com.

    d. Kennedy Valve, Elmira, NY www.kennedyvalve.com.

    e. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.

    f. Mueller Company, Decatur, IL www.muellerflo.com.

    g. Nibco Inc, Elkhart, IN www.nibco.com.

B. Description:

1. Automatic wet-pipe fire sprinkler system starting at flange in Fire Riser Room and extending throughout heated portions of building.

2. Dry sprinkler heads preferred over and into Vestibules.

C. Performance:

1. Design Criteria:

    a. Area of Application and Corresponding Design Density:

        1) Serving Area and Mechanical, Electrical, and Janitorial Areas:

            a) Ordinary Hazard Group 1.

            b) Design density = 0.15 gpm per sq ft over 1,500 sq ft (140 sq m).

        2) Storage Areas:

            a) Ordinary Hazard Group 2.

            b) Design density = 0.20 gpm per sq ft over 1,500 sq ft (140 sq m).

        3) All Other Areas:

            a) Light Hazard.

            b) Design density = 0.10 gpm per sq ft over 1,500 sq ft (140 sq m).

        4) Increase remote areas by 30 percent where ceiling / roof is sloped more than 2 inches (50 mm) per ft.

        5) Remote areas may be reduced within parameters indicated in NFPA 13 for use of quick response sprinklers throughout.

    b. Maximum Coverage per Sprinkler Head:

1) Ordinary Hazard Areas: 130 sq ft (12.1 sq meters).

2) Attic Areas: 120 sq ft (11.2 sq meters).

3) Light Hazard Areas: 225 sq ft (20.1 sq meters).

c. Design Area shall be hydraulically most remote area in accordance with NFPA 13.

1) Provide a 10 PSI safety allowance under adjusted water flow supply curve.

d. Maximum velocity of water flow within piping: 20 feet (6.1 m) per sec.

D. Components:

1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.

a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.

b. Ductile iron fittings of foreign manufacture are acceptable.

2. Pipe:

a. Schedule 40 Welded Steel:

1) Exterior, Above Ground: Schedule 40 hot-dip galvanized welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.

2) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.

3) Connections:

a) 2 inches (50 mm) And Smaller: Screwed, flanged, or roll grooved coupling system.

b) 2-1/2 inches (64 mm) And Larger: Flanged or roll grooved coupling system.

3. Fittings:

a. Usage:

1) 2 inches (50 mm) And Smaller: Welded, screwed, flanged, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.

2) 2-1/2 inches (64 mm) And Larger: Welded, flanged, or roll grooved coupling system.

b. Types And Quality:

1) Screwed:

a) Cast iron meeting requirements of ANSI B16.4 or ductile iron meeting requirements of ANSI B16.3 and ASTM A536, Grade 65-45-12.

b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.

c) Do not extend pipe into fittings to reduce waterway.

d) Ream pipe after cutting to remove burrs and fins.

2) Flanged: Steel meeting requirements of ANSI B16.5.

3) Welded:

a) Carbon steel meeting requirements of ASTM A234/A234M.

b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with AWS B2.1, level AR3.

4) Roll Grooved Pipe Coupling System:

a) Ductile iron meeting requirements of ASTM A395/A395M and ASTM A536, and UL listed.

b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.

c) Category Four Approved Products: See Section 01 6200 for definition of Categories:

	Gruvlok	Tyco (Grinnell)	Victaulic
Rigid Couplings	7401	772	Style 005
Flexible Couplings [1]	7000	705	Style 75
Flange Adaptors [2]	7012	71	Style 744
Grooved Coupling Gaskets [3]	'E' EPDM	Grade 'E' EPDM	'E' EPDM [4]

[1] Use in locations where vibration attenuation, stress relief, thermal expansion, or seismic design is required / needed.

[2] Class 125 or 150.

[3] Temperature rated 30 to 150 deg F (minus one to plus 65 deg C). NSF-61 certified.

[4] Grade 'A'.

c. Use of saddle or hole cut type mechanical tees is NOT APPROVED.

4. Valves:

a. Butterfly Valves:

1) Design Criteria:

a) UL / CASA approved.

b) Indicating type.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Milwaukee:

(1) Model BB-SCS02 threaded ends with tamper switch one inch (25 mm) to 2 inches (50 mm).

(2) Model BBVSCS02 Grooved ends with tamper switch 2 inches (50 mm) to 2-1/2 inch (64 mm).

b) Nibco:

(1) Model WD3510-8 Wafer type with valve tamper switch.

(2) Model GD4765-8N Grooved type with valve tamper switch, 2-1/2 inches (64 mm) to 8 inches (200 mm).

c) Tyco (Grinnell):

(1) Model BFV-N wafer.

(2) Model BFV-N grooved.

d) Victaulic: Series 705W Grooved end type with internal supv. switches.

e) Kennedy:

(1) Model 01W wafer.

(2) Model G300 grooved.

b. Gate Valves:

1) Design Criteria:

a) UL / CASA approved.

b) Outside Screw and Yoke Type (O.S.&Y).

c) Class 150 psi.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Nibco:

(1) T-104-0 with Threaded Ends 1/2 inch (12.7 mm) to 2 inches (50 mm).

(2) F-637-31 Flanged Ends.

b) Mueller: R-2360-6 Flanged Ends.

c) Victaulic: Series 771 Grooved Ends

c. Ball Valves:

1) Design Criteria:

a) UL / CASA approved.

b) Valve tamper switch.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Milwaukee: BB-SCS02 with threaded ends.

b) Nibco: KT-505 with threaded ends.

c) Nibco: KG-505 with grooved ends.

d) Victaulic: Series 728 with grooved or threaded ends.

d. Swing Check Valves:

1) 1/2 to 3 inch (13 to 75 mm) horizontal check.

a) Design Criteria:

(1) Regrinding type.

(2) Renewable disk.

(3) Bronze Class 125 with threaded ends.

b) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

(1) Nibco: KT-403-W.

(2) Victaulic: Series 712.

(3) Viking: G-1 Grooved ends.

2) 2 to 4 inch (50 to 100 mm) Horizontal check:

a) Design Criteria:

(1) Grooved ends.

(2) Ductile iron body.

(3) Rated 300 psi (2.07 MPa).

b) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

(1) Tyco (Grinnell): CV-1F Grooved ends.

(2) Victaulic: Series 712.

(3) Viking: G-1 Grooved ends.

3) 3 to 12 inch (76 to 300 mm) Horizontal check:

a) Design Criteria:

(1) Bolted bonnet.

(2) Raised face flanges.

(3) Bronze mounted with ductile iron body.

(4) 125 lb (56.7 kg) Class A.

b) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

(1) Nibco: F-938-31.

(2) Mueller: A-2120-6.

(3) Viking: F-1 grooved and flanged.

e. Wafer Type Check Valves:

1) Design Criteria:

a) 4 to 8 inch (100 to 300 mm) cast iron body.

b) 175 psi (1.21 MPa) minimum working pressure.

c) Rubber Seat.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Nibco: KW-900-W.

b) Mueller: A-2102.

c) Kennedy: Fig.706.

f. Grooved-End Check Valves:

1) Design Criteria:

a) UL / CASA listed and approved to 250 psi (1.72 MPa) maximum operating pressure.

b) 2-1/2 to 12 inch (64 to 300 mm) ductile iron body.

c) Disc And Seat:

(1) 2-1/2 And 3 Inch (64 to 75 mm): Aluminum bronze disc with mounted elastomer seal and PPS (polyphenylene sulfide) coated seat.

(2) 4 Inch (100 mm) And Larger: Elastomer encapsulated ductile iron disc with welded in nickel seat.

(3) Viking: Model VK462.

2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

a) Nibco: KG-900-W grooved ends.

b) Victaulic: Series 717.

c) Kennedy: Fig.426.

g. Alarm Check Valves:

1) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Reliable: E with gauges and drain.

b) Tyco (Grinnell): Model AV-1-300.

c) Victaulic: Series 751 with gauges and drain.

d) Viking: J-1 with gauges and drain.

h. Backflow Preventer: Make and model shown on Drawings or as required by local codes.

i. Retard Chamber:

1) Design Criteria:

a) Self-draining.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Reliable: E-1.

b) Victaulic: Series 752.

c) Viking: C-1.

j. Inspector's Test Valve:

1) Design Criteria:

a) Bronze body with threaded or grooved ends.

b) Combination sight glass / orifice.

2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

a) Tyco (Grinnell): Model F350.

b) Victaulic: Testmaster Alarm Test Module Style 720.

5. Sprinkler Heads:

a. Concealed Pendant:

1) Design Criteria:

a) Adjustable cover.

b) UL / CASA listed and approved.

c) Coordinate concealed cover finish with Architect.

2) Type One Acceptable Products:

a) Wet Pendant, Flat Profile:

(1) Reliable: F4FR.

(2) Victaulic: Model 3802.

(3) Viking: Model VK462.

(4) Tyco (Grinnell): Model RF11.

(5) Equal as approved by Architect before bidding. See Section 01 6200.

b) Dry Pendant:

(1) Flat Profile:

(a) Tyco (Grinnell): DS-C.

(b) Victaulic: V3618.

(2) Equal as approved by Architect before bidding. See Section 01 6200.

b. Horizontal Sidewall Sprinkler:

1) Design Criteria:

a) UL / CASA listed and approved.

b) Recess adjustable.

c) Where guards are required, use chrome plated sprinkler guards that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.

2) Type One Acceptable Products:

a) Wet System:

(1) Reliable: F1FR.

(2) Tyco (Grinnell): Model TY-FRB.

(3) Victualic: Model V2710.

(4) Viking: VK305.

(5) Equal as approved by Architect before bidding. See Section 01 6200.

b) Dry System:

(1) Reliable: F3QR.

(2) Tyco (Grinnell): DS-1.

(3) Victualic: Model V3610.

(4) Viking: VK162.

(5) Equal as approved by Architect before bidding. See Section 01 6200.

c. Attic Sprinklers, Upright:

1) Design Criteria:

a) UL / CASA listed and approved.

b) Approved for use in roof structures, combustible and non-combustible, with ceiling below.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Tyco: BB, SD, or HIP.

d. Pendant Sprinklers:

1) Design Criteria:

a) UL / CASA listed and approved.

b) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.

2) Type One Acceptable Products:

a) Reliable: F1FR.

b) Tyco: TY-FRB.

c) Victaulic: Model V2704.

d) Viking: VK302.

e) Equal as approved by Architect before bidding. See Section 01 6200.

e. Upright Sprinklers:

1) Design Criteria:

a) UL / CASA listed and approved.

2) Type One Acceptable Products:

a) Reliable: F1FR.

b) Tyco: TY-FRB.

c) Victaulic: Models V2704.

d) Viking: VK300.

e) Equal as approved by Architect before bidding. See Section 01 6200.

6. Water Flow Alarm:

a. Electric Flow Alarm:

1) Design Criteria:

a) UL / CASA listed and approved.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Potter Electric: Horn Strobe, SASH-120, 120VAC.

b) System Sensor: Horn Strobe, P2RHK-120, 120 VAC.

7. Waterflow Detectors:

a. Electrical Water Flow Switch:

1) Design Criteria:

a) UL / CASA listed.

b) Switch activates with flow of 10 gpm (37.85 lpm) or more.

c) Two single pole double throw switches.

d) Automatic reset.

2) Category Four Approved Products: See Section 01 6200 for definitions of Categories:

a) Potter-Roemer: Model 6201 thru 6208.

b) System Sensor: WFD20 thru WFD80.

c) Viking: VSR-F.

8. Tamper Switch

a. Weather and Tamper Resistant Switch.

1) Design Criteria:

a) UL / CASA listed.

b) Mount to monitor valve and not interfere with operation.

c) Shall operate in horizontal and vertical position.

2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

a) Control Valves, Butterfly Valves, Post Indicator Valves:

(1) Potter Electric: Model PCVS.

(2) Notifier: Model PIBV2.

(3) System Sensor: Model PIBV2.

b) O.S. & Y Valves:

(1) Potter Electric: Model OSYSU.

(2) System sensor: Model OSY2.

9. Automatic Drain Device:

a. Design Criteria:

1) Straight Design, 3/4 inch: (19 mm).

b. Category Four Approved Products: See Section 01 6200 for definitions of Categories:

1) Nibco: Ball-Drip.

2) Potter-Roemer: Figure 5982.

3) Viking: B-1.

10. Fire Department Connection:

a. One Way Inlet with 5” Stortzguard Cap:

1) Class One Quality Standards: See Section 01 6200:

a) Round 'AUTO SPKR' identification plate, red enamel finish aluminum plate:

(1) Croker: Fig 6766.

(2) Potter-Roemer Fig. 5966.

2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

a) Rough chrome plated:

(1) Croker: 6405-RC.

(2) Potter-Roemer: Fig. 5710-C.

b) Caps and Chains:

(1) Croker: 6747 RC.

(2) Potter-Roemer: 4625.

11. Indicating Post Valve:

a. Design Criteria:

1) As specified in Section 33 1119: 'Fire Suppression Water Distribution Piping'.

2) Prefer exposed parts non-brass, for theft protection.

3) Supervisory switch.

b. Category Four Approved Products: See Section 01 6200 for definitions of Categories:

1) As required by Authority Having Jurisdiction (AHJ).

12. Riser Manifold Assembly:

a. Design Criteria:

1) Groove x Groove Manifold Body.

2) Water Flow Alarm Switch, VSC with Vane, UL / CASA listed and approved.

3) 300 psi (2.07 MPa) Water Pressure Gauge.

4) Test and Drain Valve with Manifold Drain Trim and 1/2 inch (12.7 mm) diameter test Orifice.

5) Pressure Relief Valve, 175 psi (1.21 MPa), non adjustable, pipe discharge to test Drain Valve.

b. Category Four Approved Products: See Section 01 6200 for definitions of Categories:

1) Tyco: Model 513.

2) Victaulic: Style 747P.

2.2 ACCESSORIES

A. Manufacturers:

1. Manufacturer Contact List:

a. Anvil International, Portsmouth, NH www.anvilintl.com.

b. Cooper B-Line, Highland, IL www.b-line.com.

B. Hangers, Rods, And Clamps:

1. Design Criteria:

a. Galvanized, unless specified otherwise, and UL / CASA approved for service intended.

2. Class One Quality Standard:

a. Hangers and accessories shall be Anvil numbers specified or equals by Cooper B-Line.

b. Pipe Ring Hangers: Equal to Anvil Fig 69.

c. Riser Clamps: Equal to Anvil Fig. 261.

C. Posted System Diagram:

1. Provide single, color-coded floor plan diagram showing total system. Color antifreeze pipe system elements BLUE and wet pipe system elements RED. Indicate locations of antifreeze system drains and sample test station.

2. Include following information on diagram sheet:

a. Explanation of how to test an antifreeze system.

b. Step by step shut down procedure.

c. Step by step system drainage procedure.

d. Step by step start-up procedure.

e. Step by step procedure for protection of system from freezing.

3. Laminate diagram with plastic and mat or frame suitable for hanging near riser.

D. Steel Deck Bracket:

1. Class Two Quality Standard: See Section 01 6200.

a. Unistrut P1000 with clamp nut, minimum 6 inch (150 mm) length.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers. See Section 01 4301:

1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. Drawings:

1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit. Install system so it drains.

2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These Drawings take precedence over Fire Protection Drawings.

3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions and to enable system to drain.

3.3 INSTALLATION

A. Interface With Other Work: Provide inserts for attaching hangers in concrete floor construction at time floors are placed.

B. Connect system to flange provided under Section 33 1119. After installation of riser, fill annular space between pipe and slab with flexible mastic.

C. Install sprinkler systems in accordance with requirements of latest editions of NFPA 13 and as specified below:

1. Provide maintenance access to equipment

2. Conceal sprinkler lines installed in occupied areas. In Mezzanine areas, route pipe to side or underneath Mezzanine walkway. Do not impede egress from Attic.

3. Install to enable drainage of system.

a. Install main drain from riser according to NFPA 13, paragraph 8.17.4.

4. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.

5. Do not use dropped, damaged, or used sprinkler heads.

6. Install tamper switches and flow detectors where located by Architect.

7. Except for Siamese connection, install automatic ball drip device in lowest point of piping to fire department connection and drain to floor drain or to exterior of building.

8. Brace and support system to meet seismic zone requirements for building site.

9. Inspector's Test and Drain to be placed in a location approved by the architect.

D. Flush system at full design flow rate for minimum five minutes. Route water to outside of building. Protect landscaping and other exterior elements from damage during flow tests.

3.4 FIELD QUALITY CONTROL

A. Field Tests:

1. Pressure Test:

a. Hydrostatically test system to 200 psi (1.38 MPa) minimum for 2 hours as required by 'Contractor's Material And Testing certificate for Above Ground Piping' NFPA-13, Figure Figure 24.1 (2010) Edition).

b. If system or part of system is to have a glycol solution, hydrostatic test is to be performed using approved glycol solution. Do not hydrostatically test any section of system that is to be filled with a glycol solution with plain water.

2. Water Flow Test:

a. Test to determine static and residual pressures and corresponding flow rate at point of connection to utility water main.

b. Adjust water flow test data for seasonal fluctuations and future growth as recommended by Water Utility and AHJ.

c. At point of connection to utility water main, combine inside and outside hose stream allowances.

3. Check piping in relation to insulation envelope to be certain piping and auxiliary drains are properly enclosed inside building insulation envelope. Report unsatisfactory conditions to Architect.

4. Tests shall be witnessed by Architect and representative of local jurisdiction over fire prevention.

3.5 CLOSE-OUT ACTIVITIES

A. Instruction of Owner:

1. Instruction Sessions:

a. Instruct Owner's personnel in operation and maintenance of system utilizing ‘Operation And Maintenance Manual’ when so doing. Minimum instruction period shall be four (4) hours.

1) Include antifreeze system requirement to be tested at least once a year.

b. Instruction sessions shall occur after Substantial Completion inspection when system is properly working and before final payment is made.

c. Provide Owner with latest version of NFPA 25.

B. Training:

1. Installer required to provide FM Training from latest version of NFPA 25 with checklist and brief explanation of following inspections:

a. Weekly Inspection.

b. Monthly Inspection.

c. Quarterly Inspection.

d. Semi-Annual Inspection.

e. Annual Inspection.

END OF SECTION

SECTION 22 01 00
SUMMARY OF PLUMBING WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Plumbing Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC
3533 Moreland Dr. Ste. A
Weslaco, Texas 78596
Phone Number: (956) 973-0500
Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install systems and equipment as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect all water, sewer, and/or power to fixtures.

2. Provide all materials and labor associated with a complete operational installation of new systems including, but not limited to:

- Fixtures for facility
- Piping for Sanitary Sewer and Vent Systems
- Piping for Domestic water and Hot Water Systems.

1.2 COORDINATION

A. All plumbing work shall be done under sub-contract to a General Contractor. Plumbing Contractor shall coordinate all work through General Contractor, even in areas where only plumbing work is to take place.

B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.

C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to plumbing equipment.

1.3 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.

2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.4 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy and use by the public.

   2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

   1. Temporary fencing around construction areas.

   2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.

   3. Temporary fencing around equipment while site work is in progress.

1.5 SUBMITTALS

1. All equipment and fixtures shall be provided with a submittal.

2. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire plumbing or in a bound enclosure. This will eliminate delays in the submittal process.

.

END OF SECTION

SECTION 22 05 01
COMMON PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common requirements and procedures for plumbing systems.
   2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
   3. Furnish and install sealants relating to installation of systems installed under this Division.
   4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.

B. Products Furnished But Not Installed Under This Section:
   1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's catalog data for each manufactured item.
         1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
         2) Include name, address, and phone number of each supplier.

B. Informational Submittals:
   1. Qualification Statement:
      a. Plumbing Subcontractor:
         1) Provide Qualification documentation if requested by Architect or Owner.
      b. Installer:
         1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):
         1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included:
            a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.

b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
(1) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
(2) Manufacturer's maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
c) Provide operating instructions to include:
(1) General description of fire protection system.
(2) Step by step procedure to follow for shutting down system or putting system into operation.

b. Warranty Documentation:
1) Include copies of warranties required in individual Sections of Division 22.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
3. Identification:
a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

B. Qualifications.
1. Plumbing Subcontractor:
a. Company specializing in performing work of this section.
1) Minimum five (5) years experience in plumbing installations.
2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
b. Upon request, submit documentation.
2. Installer:
a. Licensed for area of Project.
b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Accept valves on site in shipping containers with labeling in place.
2. Provide temporary protective coating on cast iron and steel valves.
3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Storage And Handling Requirements:

1. In addition to requirements specified within, stored material shall be readily accessible for inspection by Architect/engineer until installed.
2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

A. Manufacturer Warranty:
   1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.

B. Special Warranty:
   1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
   2. If plumbing sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

B. Pipe And Pipe Fittings:
   1. Weld-O-Let and Screw-O-Let fittings are acceptable.
   2. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA are acceptable.

C. Sleeves:
   1. General:
      a. Two sizes larger than bare pipe or insulation on insulated pipe.
   2. In Concrete And Masonry:
      a. Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
   3. In Framing And Suspended Floor Slabs:
      a. Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal.

D. Valves:
   1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers:
   1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. Drawings:
   1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
   2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
   3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

B. Verification Of Conditions:
   1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
   2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
   3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
   4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.3 PREPARATION

A. Demolition Requirements:
   1.

B. Changes Due To Equipment Selection:
   1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
   2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
   3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
   4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.4 INSTALLATION

A. Interface With Other Work:
   1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.

2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.
3. Furnish inserts for attaching hangers that are to be cast in concrete floor construction at time floors are poured.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:
1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
4. Determine exact route and location of each pipe before fabrication.
    a. Right-Of-Way:
        1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
        2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
    b. Offsets, Transitions, and Changes in Direction:
        1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
        2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.

D. Penetration Firestops:
1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.

E. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
    a. Arrange so as to facilitate removal of tube bundles.
    b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
        1) Make connections of dissimilar metals with di-electric unions.
        2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.

c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe 3/4 inch (19 mm) in diameter and smaller.
d. Install piping systems so they may be easily drained
e. Install piping to insure noiseless circulation.
f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.

3. Do not install piping in shear walls.
4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
6. Make changes in direction with proper fittings.
7. Expansion of Thermoplastic Pipe:
   a. Provide for expansion in every 30 feet of straight run.
   b. Provide 12 inch offset below roof line in each vent line penetrating roof.
8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.

G. Sleeves:
1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade (unless noted on plans).
2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe (if used) penetrations through studs and floor slabs.
3. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:
1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.5 REPAIR / RESTORATION

A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it:
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
2. Surface finishes shall exactly match existing finishes of same materials.

3.6 FIELD QUALITY CONTROL

A. Field Tests:
1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:
   1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
   2. Repeat tests on new material, if requested.

3.7 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation:
   1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
   2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
   3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

3.8 CLOSEOUT ACTIVITIES

A. Instruction of Owner:
   1. Instruct building maintenance personnel in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
   2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.9 PROTECTION

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common hanger and support requirements and procedures for plumbing systems.

B. Products Installed But Not Furnished Under This Section:
   1. Paint identification for gas piping used in HVAC equipment.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Manufacturer Contact List:
      a. Anvil International,
      b. Cooper B-Line,
      c. Unistrut, Wayne,

B. Materials:
   1. Hangers, Rods, And Inserts
      a. Galvanized and UL approved for service intended.
      b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
         1) Support insulated pipes 2 inches in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
            a) Type Two Acceptable Products:
               (1) Swivel Ring Hanger: Anvil Fig. 69.
               (2) Insulation Protection Shield: Anvil Fig. 167.
               (3) Equals by Cooper B-Line.
         2) Support insulated pipes 2-1/2 inches in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
            a) Type Two Acceptable Products:
               (1) Clevis Hanger: Anvil Fig. 260.

(2) Roller Assembly: Anvil Fig. 171.
(3) Insulation Protection Shield: Anvil Fig. 167.
(4) Equals by Cooper B-Line.

3) Support uninsulated copper pipe 2 inches in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
a) Type Two Acceptable Products:
(1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
(2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
(3) Equals by Cooper B-Line.

4) Support uninsulated copper pipe 2-1/2 inches in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
a) Type Two Acceptable Products:
(1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
(2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
(3) Equals by Cooper B-Line.

c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 inches

d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

1) Size trapeze angles so bending stress is less than 10,000 psi

e. Riser Clamps For Vertical Piping:
1) Type Two Acceptable Products:
a) Anvil Fig. 261.
b) Equals by Cooper B-Line.

f. Concrete Inserts:
1) Individual Inserts:
a) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
b) Type Two Acceptable Products:
(1) Anvil Fig. 282.
(2) Equals by Cooper B-Line.
2) Continuous Inserts:
a) Class Two Quality Standard: Equal to Unistrut P-3200 series.

g. Steel Deck Bracket:

1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch length.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: If project contains concrete structural system.
   1. Furnish inserts for attaching hangers that are to be cast in concrete floor construction at time floors are poured.

B. Piping:
   1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
      a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
      b. Supports For Horizontal Piping:
         1) Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
         2) Support thermoplastic pipe at 48 inches on center maximum.
         3) Support PEX pipe at 32 inches minimum on center.
         4) Provide support at each elbow. Install additional support as required.
      c. Supports for Vertical Piping:
         1) Place riser clamps at each floor or ceiling level.
         2) Securely support clamps by structural members, which in turn are supported directly from building structure.
         3) Provide clamps as necessary to brace pipe to wall.
      d. If Structural concrete systems are used: Install supports from inserts cast into concrete floor system, including concrete joists and floor slabs. Where inserts cannot be used, provide expansion shields and support hangers from angles held in place by expansion bolts, never directly from expansion bolt itself. Provide calculations necessary to determine number of expansion bolts required to equal capacity of cast-in-place insert.
      e. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
      f. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
   2. Gas piping Identification:
      a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:
   1. Labels:
      a. Equipment Identification:
         1) Black formica, with white reveal when engraved.
         2) Lettering to be 3/16 inch high minimum.
   2. Paint:
      a. One Coat Primer:
         1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
         2) 6-205 Metal Primer under dark color paint.
         3) 6-6 Metal Primer under light color paint.
      b. Finish Coats: Two coats 53 Line Acrylic Enamel.
      c. Type Two Acceptable Products.
         1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
            a) Benjamin Moore,
            b) ICI Dulux,
            c) Sherwin Williams,

PART 3 - EXECUTION

3.1 APPLICATION

A. Labels:
   1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
      a. Water Heaters.
   2. Engrave following data from Equipment Schedules on Drawings onto labels:
      a. Equipment mark.
      b. Room(s) served.
      c. Panel and breaker from which unit is powered.

B. Painting:
   1. Only painted legends, directional arrows, and color bands are acceptable.
   2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
      a. Adjacent to each item of equipment.

b. At point of entry and exit where piping goes through wall.
c. On each riser and junction.
d. Every 25 feet on long continuous lines.
e. Stenciled symbols shall be one inch high and black.

3.2 ATTACHMENTS

A. Schedules:
1. Pipe Identification Schedule:
a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CW
Domestic Hot Water	HW

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
   2. Furnish and install insulation on roof drain piping as described in Contract Documents.

B. Related Requirements:
   1. Section 22 1116: 'Domestic Water Piping'.
   2. Section 22 1400: 'Facility Storm Drainage'.(if provided on plans)

1.2 SUBMITTALS

A. Informational Submittals:
   1. Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Manufacturers:
1. Manufacturer Contact List:
a. Armacell, Mebane, NC www.armaflex.com.
b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
c. IMCOA, Youngsville, NC www.nomacokflex.com.
d. Johns-Manville, Denver, CO www.jm.com.
e. Knauf, Shelbyville, IN www.knauffiberglass.com.
f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
g. Nomaco Inc, Yopungsville, NC www.nomacokflex.com.
h. Owens-Corning, Toledo, OH www.owenscorning.com.
i. Speedline Corp, Solon, OH www.speedlinepvc.com.
j. CertainTeed Manson.
k. Knauf FiberGlass GmbH.
l. Owens-Corning Fiberglas Corp.
m. Schuller International, Inc.
n. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
o. Armstrong World Industries, Inc.
p. Rubatex Corp.

B. Materials:
1. Above Grade Metal Piping:
a. Insulation For Piping:
1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
2) Insulation Thickness:

Service Water Temperature	Pipe Sizes Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In

3) Performance Standards:
Fiberglas ASJ by Owens-Corning.
4) Type One Acceptable Manufacturers:
a) Childers Products.
b) Knauf.
c) Manson.
d) Owens-Corning.
e) Johns-Manville.
f) Equal as approved by Architect before bidding. See Section 01 6200.

b. Fitting, Valve, And Accessory Covers:
   1) PVC.
   2) Performance Standard: Zeston by Johns-Manville.
   3) Type One Acceptable Manufacturers:
      a) Knauf.
      b) Speedline.
      c) Johns-Manville.
      d) Equal as approved by Architect before bidding. See Section 01 6200.

2. Below Grade Metal Piping:
   a. Insulation:
      1) 1/2 inch (13 mm) thick.
      2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) SS Tubolit by Armacell.
         b) ImcoLock by Imcoa.
         c) Nomalock or Therma-Cel by Nomaco.
   b. Joint Sealant:
      1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) Armacell 520.
         b) Nomaco K-Flex R-373.

3. Pex Piping, Above And Below Grade:
   a. Insulation:
      1) 1/2 inch (13 mm) thick.
      2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) SS Tubolit
         b) by Armacell.
         c) ImcoLock by Imcoa.
         d) Nomalock or Therma-Cel by Nomaco.
   b. Joint Sealant:
      1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) Armacell 520.
         b) Nomaco K-Flex R-373.
         c)

4. PP-R Piping, Above And Below Grade:
   a. Insulation:
      1) 1/2 inch (13 mm) thick.
      2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) SS Tubolit by Armacell.
         b) ImcoLock by Imcoa.
         c) Nomalock or Therma-Cel by Nomaco.
   b. Joint Sealant:
      1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
         a) Armacell 520.
         b) Nomaco K-Flex R-373.

5. PVC or ABS Piping, Above And Below Grade - Facility Storm Drain:
   a. Insulation:
      1) 1/2 inch (13 mm) thick.
      2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:

a) SS Tubolit by Armacell.
b) ImcoLock by Imcoa.
c) Nomalock or Therma-Cel by Nomaco.

b. Joint Sealant:
1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) Armacell 520.
b) Nomaco K-Flex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

A. Above Grade Piping:
1. Apply insulation to clean, dry piping with joints tightly butted.
2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
3. Piping up to 1-1/4 inch Diameter:
a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
b. Adhere 3 inch wide self-sealing butt joint strips over end joints.
4. Piping 1-1/2 inches Diameter And Larger:
a. Use broken-joint construction in application of two-layer covering.
b. Fill cracks and depressions with insulating cement mixed to thick plastic paste.
1) Apply by hand in several layers to make up total specified thickness.
2) Final layer shall have smooth uniform finish before application of covering.
5. Fittings, Valves, And Accessories:
a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
c. Piping Up To 1-1/4 Inch Diameter:
1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
2) Alternate Method:
a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
d. Piping 1-1/2 inches To 2 Inches :
1) Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation.
2) Apply final coat of fitting mastic over insulating cement.
e. Piping 2-1/2 inch And Larger:
1) Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement.
2) Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
6. Pipe Hangers:
a. Do not allow pipes to come in contact with hangers.
b. Pipe Shield:

1) Provide schedule 40 PVC by 6 inch ong at each clevis and/or unistrut type hanger.
2) Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
3) Provide 22 ga by 6 inch long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.

c. At Pipe Hangers:
1) Provide rigid calcium silicate insulation (100 psi compressive strength) at least 2 inches beyond shield.

7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

B. Below Grade Piping:
1. Slip underground pipe insulation onto pipe and seal butt joints.
2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

3.2 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.3 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.4 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Section "Firestopping."

3.5 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation

without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 CLOSED-CELL PHENOLIC-FOAM INSUALTION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer’s written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
3. Apply insulation to flanges as specified for flange insulation application.

4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Fire-suppression piping.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water piping.

1. Operating Temperature: 60 to 80 deg F
2. Insulation Material: Mineral Fiber
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Domestic hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber
3. Insulation Thickness: 1” thick
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: No
6. Finish: None.

C. Service: Condensate and equipment drain piping.

1. Operating Temperature: 40 to 60 deg F
2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
3. Insulation Thickness: 3/4”
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No.
6. Finish: Two coats of the insulation manufacturer’s recommended protective coating.

D. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Aluminum Jacket on building exterior application only.
5. Vapor Retarder Required: Yes.
6. Finish: None.

E. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).

1. Operating Temperature: 35 to 90 deg F
2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
3. Insulation Thickness: larger of 1” or mfr’s recommendations.
4. Field-Applied Jacket: scrim reinforced foil
5. Vapor Retarder Required: None.
6. Finish: None.

3.11 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses: 1”
4. Field-Applied Jacket: Aluminum.
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses: ½”
4. Field-Applied Jacket: Aluminum
5. Vapor Retarder Required: Yes.
6. Finish: None.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required by work of this Section.
   2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter as described in Contract Documents.

1.2 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

   1. Domestic Water Distribution Piping: 125 psig..

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For pipe, tube, fittings, and couplings.
   2. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

B. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Written report of sterilization test.

C. Shop Drawings:
      a. Piping Layout:
         1) Provide as-built drawings at end of project.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
   2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.

D. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
   1. Manufacturer Contact List:
      a. Aquatherm, Inc.,
      b. Cash Acme,
      c. Cla-Val Company,
      d. Conbraco Industries Inc,
      e. Hammond Valve,
      f. Handy & Harmon Products Div,
      g. Honeywell Inc,
      h. Leonard Valve Co,
      i. Milwaukee Valve Co,
      j. Nibco Inc,
      k. Rehau,
      l. Sloan Valve Co,
      m. Spence Engineering Co,
      n. Symmons Industries, Braintree,
      o. Uponor Inc,
      p. Viega ProPress, Wic
      q. Watts Regulator Co,
      r. Wilkins (Zurn Wilkins),
      s. Zurn PEX, Inc.

B. Materials:
   1. Design Criteria:
      a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
      b. No CPVC allowed.
   2. Pipe:
      a. Copper:
         1) Above-Grade:
            a) Meet requirements of ASTM B88, Type K & L.
            b. Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn tempered.
            c. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
            d. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
            e. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
            f. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

a) Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2) Below-Grade:
a) Meet requirements of ASTM B88, Type K. 3/4 inch minimum under slabs.
b) 2 inches And Smaller: Annealed soft drawn.
c) 2-1/2 inches And Larger: Hard Drawn.

3) Fittings:
a) For Copper Pipe: Wrought copper.

3. Connections For Copper Pipe:
a. Above-Grade:
1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
2) Viega ProPress System
b. Below Grade:
1) Brazed using following type rods:
a) Copper to Copper Connections:
(1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
(2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
3) Do not use rods containing Cadmium.
4) Brazing Flux:
a) Approved Products:
(1) Stay-Silv white brazing flux by Harris Product Group.
(2) High quality silver solder flux by Handy & Harmon.
5) Joints under slabs acceptable only if allowed by local codes.

4. Ball Valves:
a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
b. Valves shall be two-piece, full port for 150 psi SWP.
1) Operate with flow in either direction, suitable for throttling and tight shut-off.
2) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
3) Seat: Bubble tight at 100 psig under water.
c. Class One Quality Standard: Nibco T585 or S585.
1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.

5. Combination Pressure Reducing Valve / Strainer:
a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
b. Built-in thermal expansion bypass check valve.
c. Class One Quality Standard: Watts LFU5B:
1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Below Grade:
1. Install piping under slabs without joints where possible.
2. Insulate water piping buried within building perimeter.
3. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.

B. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
1. Before pipes are covered, test systems in presence of Architect/Engineer at 125 psig hydrostatic pressure for four (4) hours and show no leaks.
2. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.

3.3 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

2. Adjust calibrated balancing valves to flows indicated.

3.4 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Balancing valves.
2. Washer-supply outlets.
3. Key-operation hydrants.
4. Trap seal primer valves.
5. Drain valves.
6. Miscellaneous piping specialties.
7. Sleeve penetration systems.
8. Flashing materials.

1.2 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

PART 2 - PRODUCTS

2.1 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
1. Manufacturers:

1. Armstrong Pumps, Inc.
2. Flow Design, Inc.
3. ITT Industries; Bell & Gossett Div.
4. Taco, Inc.
5. Watts Industries, Inc.; Water Products Div.

2. 2” and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. 2” and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
4. 2.5” and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) mininmum CWP. Include two-piece, copper-alloy body with full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Manufacturers:

1. Conbraco Industries, Inc.
2. Crane Co., Crane Valve Group; Crane Valves.
3. Grinnell Corporation.
4. NIBCO INC.
5. Red-White Valve Corp.

2.2 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

2.3 OUTLET BOXES

A. Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Symmons Industries, Inc.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:

1. Box and Faceplate: [Stainless steel] [Enameled or epoxy-painted steel].
2. Shutoff Fitting: Two hose bibbs.
3. Supply Fittings: Two NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
4. Drain: NPS 2 (DN 50) standpipe, P-trap, and direct waste connection to drainage piping.
5. Inlet Hoses: Two ASTM D 3571, 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female hose-thread couplings.
6. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

D. Icemaker Outlet Boxes: With hose connection and the following:

1. Box and Faceplate: Stainless steel.

2. Shutoff Fitting: Hose bibb.
3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.4 KEY-OPERATION HYDRANTS

A. Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Woodford Manufacturing Co.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig.

1. Inlet: 3/4 " or NPS 1" threaded or solder joint.
2. Outlet: ASME B1.20.7, garden-hose threads.
3. Operating Keys: One with each key-operation hydrant.

C. Moderate-Climate, Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral nonremovable hose-connection vacuum breaker, and concealed outlet.

1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.

D. Hot and Cold, Nonfreeze Concealed-Outlet Wall Hydrants: With deep flush-mounting box with cover; hot- and cold-water casings and operating rods to match wall thickness; concealed outlet; wall clamps; and factory- or field-installed, nonremovable and manual drain-type, hose-connection vacuum breaker complying with ASSE 1011.

2.5 ROOF HYDRANTS

1. Design Criteria:
   1) Provide dual check backflow preventer.
   2) Non-freeze.
   3) Drain port - connect to drain

2.6 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. Manufacturers:

   1. Josam Co.
   2. MIFAB Manufacturing, Inc.
   3. Precision Plumbing Products, Inc.
   4. Smith, Jay R. Mfg. Co.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.

6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.7 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
   1. Manufacturers:

      1. Josam Co.
      2. Smith, Jay R. Mfg. Co.
      3. Tyler Pipe; Wade Div.
      4. Zurn Industries, Inc.; Specification Drainage Operation.

B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

C. Roof Flashing Assemblies: Manufactured assembly made of [4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-)] [6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-)] thick, lead flashing collar and skirt extending at least [6 inches (150 mm)] [8 inches (200 mm)] [10 inches (250 mm)] from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

G. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

H. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

2.8 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

   1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

1. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.9 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.
1) Not required to meet NSF International Standards for Lead Free.
2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1) Jay R. Smith: 5907.
2) Prier: P-RH2.
3) Woodford: RHY2-MS.
2. Water Hammer Arrestors:
1. Design Criteria:
1) Meet NSF International Standards for Lead Free.
2) Nesting type, air pre-charged bellows with casing.
3) Bellows constructed of stabilized 18-8 stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

B. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

C. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

D. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

E. Install expansion joints on vertical risers, stacks, and conductors if indicated.

3.2 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Ground equipment.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Connect plumbing specialties and devices that require power.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

SECTION 22 13 13
FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY
A. Includes But Not Limited To:
1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
2. Perform excavation and backfill required by work of this Section.

1.2 ADMINISTRATIVE REQUIREMENTS
A. Pre-Cover Observation.
1. Contact Architect/Engineer prior to covering any section of pipe.
2. All piping all be under pressure during observation

1.3 REFERENCES
A. Reference Standards:
1. International Code Council:
a. ICC IPC-2012, 'International Plumbing Code'.

1.4 PERFORMANCE REQUIREMENTS
A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS
A. Product Data: For pipe, tube, fittings, and couplings.
B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.
C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE
A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PVC PIPING

A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

C. Plenum Vent Lines: In areas of building with a return air plenum.

a. Approved Types:

1) Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.

2) Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.

b. Joint Material:

1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.

2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.

c. Fittings:

d. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A74.

1) Joint Material: Rubber gaskets meeting requirements of ASTM C564.

2) Galvanized Pipe: Screwed Durham tarred drainage type.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

C. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8- bend fittings if 2 fixture are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

E. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24 hour period of subjected to exterior water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.

F. Install soil and waste drainage and vent piping at the code required minimum slopes, unless otherwise indicated:

G. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.

3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

J. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section "Plumbing Fixtures."

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3.3 Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger

3.4 FIELD QUALITY CONTROL

A. Field Tests:

1. Conduct tests for leaks and defective work. Notify Architect before testing.

2. Thermoplastic Pipe System:

a. Before backfilling and compacting of trenches, Fill waste and vent system with water to roof level or 10 feet minimum, and show no leaks for two hours. Correct leaks and defective work.

b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

B. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

E. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.5 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 22 13 19
FACILITY SANITARY SEWER SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under this Section as described in Contract Documents.
   1. Cleanouts.
   2. Floor drains.

1.2 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
   1. Sanitary Waste and Vent Piping: 10-foot head of water.
   2. Storm Drainage Piping: 10-foot head of water.

1.3 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
   1. Cleanouts, floor drains, and roof drains.
   2. Roof flashing assemblies.
   3. Grease interceptors(if applicable)
   4. Sleeve penetration systems.

PART 2 - PRODUCTS

2.1 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

   1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

   1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
   2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

      a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.2 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.3 CLEANOUTS

A. Cleanouts: Comply with [ASME A112.36.2M] [ASME A112.3.1] <Insert other>.

1. Application: [Floor cleanout] [Wall cleanout] [For installation in exposed piping].
2. Products:
   a. Josam Co.
   b. Mifab
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe, Wade Div.
   e. Zurn Industries, Inc., Specification Drainage Operation.

2.4 FLOOR DRAINS

A. Floor Drains.
1. Products:

   a. Josam Co.
   b. Mifab
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe, Wade Div.
   e. Zurn Industries, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install expansion joints on vertical risers, stacks, and conductors if indicated.

D. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

E. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

F. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

G. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

H. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

I. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

J. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

K. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

L. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Flush with In-Ground Installation: Set unit and extension, if required, with cover flush with finished grade.
2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

M. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

N. Fasten recessed-type plumbing specialties to reinforcement built into walls.

O. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Ground equipment.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Connect plumbing specialties and devices that require power according to Division Sections.

E. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 34 00
FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, water tube type, gas-fired, domestic-water heaters.
2. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
3. Commercial, coil-type, gas-fired, domestic-water heaters.
4. Commercial, tube-type, finned-tube, gas-fired, domestic-water heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated.
   1. MT2V 1250

B. Sustainable Design Submittals:

   1. Product Data: For energy efficiency.

C. Shop Drawings:

   1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of commercial, gas-fired, domestic-water heater, from manufacturer.

C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with applicable ASME Boiler and Pressure Vessel Code.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: Limited warranty is effective as of the date of installation or 6 months after the date of manufacture, whichever is first.

    a. Commercial, Finned Tube Type, Gas-Fired, Domestic-Water Heaters:

        1) Heat Exchanger: Ten years, prorated in years 6 through 10.
        2) Controls and Other Components: One year.

PART 2 - PRODUCTS

2.1 COMMERCIAL, FINNED-TUBE, GAS-FIRED, DOMESTIC-WATER HEATERS

A. Commercial, Coil-Type, Finned-Tube, Gas-Fired, Domestic-Water Heaters (500 – 2,000 Mbh):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Laars Heating Systems Company; Mighty Therm2, MT2V, or comparable product by one of the following:

    a. Raypak, Inc.
    b. RBI; A Division of Mestek, Inc.
    c. Thermal Solutions LLC.
    d. <**Insert manufacturer's name**>.

2. Standard: ANSI Z21.10.3/CSA 4.3 for gas water heaters.
3. Description: Packaged commercial, tube type, gas-fired, domestic water heater and controls.
4. Heater Construction: ASME code with **60-psig** working-pressure rating for hot-water-boiler-type, domestic-water heater.

    a. Heat Exchanger: Horizontal, straight, finned-copper tubes with glass-lined cast iron headers.
    b. Connections: Factory fabricated of materials compatible with heater. Attach to heater before testing.

        1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
        2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

5. Heater Appurtenances:

    a. Jacket Sheet metal with powder coat, thermal set textured finish.
    b. Burner: Integral to heater **natural-gas** fuel.
    c. Automatic Ignition: ANSI Z21.10.3/CSA 4.3, proven hot surface ignition.
    d. Temperature Control: Adjustable temperature control.
    e. Connections for external staging control with selector switch that allows user to choose between on board control or external staging control.

f. Water flow switch.
g. Pressure Relief Valve: 125 psig (861 kPa).
h. Pressure and Temperature Gage: Minimum 3-1/2-inch- (89-mm-) diameter, combination water-pressure and -temperature gage. in compliance with ASME pressure vessel code.
i. Manual reset high limit stops burner if operating conditions rise above maximum heater design temperature.
j. On/off toggle switch.
k. Pump time delay.
l. Air intake filter.
m. Safety Control: Automatic, high-temperature-limit cutoff device.
n. Burner site glass.
o. Block vent switch.
p. Air pressure switch.

6. Options:

a. ASME CSD-1.
b. Cupro-nickle tube material.
c. Heater mounted pump.
d. Reversed water connections.
e. ASME HLW stamp.
f. Automatic reset high limit.
g. Low water cutoff with manual reset and test button.

7. Support: Steel base or skids.
8. Capacity and Characteristics:

a. Recovery: **1,276 gph** at **100 deg F** temperature rise.
b. Temperature Setting: Adjustable setpoint 120 **deg F.**
c. Fuel Gas Input: **1,250 Mbh.**
d. Gas Pressure Regulator:

1) Inlet Pressure: 4- to 13-in. wg (995 to 3235 Pa).

e. AHRI Certified Thermal Efficiency: 85 percent.
f. Electrical Characteristics:

1) Volts: 120-V ac.
2) Phase: Single.
3) Hertz: 60.
4) Minimum Circuit Ampacity: 15-A.

g. Minimum Vent Diameter: Model MT2V 1250 is 12-inches**.**

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Flexcon Industries.
    c. Honeywell Water Controls.
    d. Pentair Pump Group.
    e. Smith, A. O. Corporation.
    f. State Industries.
    g. Taco, Inc.
    h. <**Insert manufacturer's name**>.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

    a. Working-Pressure Rating: **150 psig .**
    b. Capacity Acceptable: **10 gal** minimum.
    c. Air Precharge Pressure: **<Insert system pressure>**.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and [**calibrated**] [**memory-stop**] balancing valves to provide balanced flow through each domestic-water heater.

F. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

G. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

H. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include **1/2-psig** pressure rating as required to match gas supply.

I. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

J. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

K. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

L. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

M. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.

N. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Assembled heater must be factory tested for safety and functionality; heater filled with water, fired throughout firing range, with all burner safety components proven. Results recorded for future reference.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in **Section 033000 "Cast-in-Place Concrete." or Section 033053 "Miscellaneous Cast-in-Place Concrete."**

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in **Section 231123 "Facility Natural-Gas Piping."**

D. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

J. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

K. Fill domestic-water heaters with water.

L. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."

C. Comply with requirements for gas piping specified in **Section 231123 "Facility Natural-Gas Piping."**

D. Drawings indicate general arrangement of piping, fittings, and specialties.

E. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. **Engage a factory-authorized service representative to train** Owner's maintenance personnel to adjust, operate, and maintain **commercial, gas-fired, storage,** domestic-water heaters.

END OF SECTION

SECTION 22 42 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Products:

a. American Standard.
b. Eljer.
c. Kohler.

2.3 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturers:

a. American Standard.
b. Eljer
c. Kohler

2.4 TOILET SEATS

A. Toilet Seat: Solid plastic.
   1. Manufacturers:

      a. Bemis.
      b. Beneke.
      c. Centoco.
      d. Church.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard, Manufactured, plastic enclosure for covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
   1. Manufacturers:

      a. Engineered Brass Co.
      b. Plumerex
      c. Truebro.

2.6 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible and standard mounting heights. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
   1. Manufacturers:
      a. Mifab
      b. Josam.
      c. Wade.
      d. Zurn

B. Urinal Support: Not required

C. Lavatory Support: Not required

D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
   1. Manufacturers:

      a. Josam.
      b. J.R. Smith
      c. Zurn.

2.7 WATER CLOSETS

A. Water Closets: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
   1. Products:

      a. American Standard, Inc.
      b. Kohler Co.
      c. TOTO USA, Inc.

B. Water Closets: Institutional Combination Lavatory/Toilet
   1. Products:

      a. ACORN

      b. All others shall be submitted for pre-approval prior to bid date.

2.8 LAVATORIES, SINKS

A. Lavatories,: Accessible, counter top, vitreous-china fixture.
   1. Products:

      a. American Standard, Inc.
      b. Kohler Co.
      c. Toto
      d. CRANE

2.9 SINKS

A. Sinks: Commercial, counter-mounting, stainless-steel fixture.
   1. Products:

      a. Elkay Manufacturing Co.
      b. Just Manufacturing Co.

2.10 SERVICE SINKS

A. Service/Mop Sinks: Floor-mounting, enameled, sink with front apron, raised back, and coated, wire rim guard.
   1. Products:

      a. Commercial Enameling Co.
      b. Kohler Co.
      c. Fiat

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

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

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

S. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 00 00
HEATING, VENTILATION AND AIR-CONDITIONING (HVAC)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Mechanical Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC

3533 Moreland Dr. Ste. A

Weslaco, Texas 78596

Phone Number: (956) 973-0500

Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install AC equipment and ductwork as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect power to unit.

2. HVAC: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:

- DX Split System A/C Units
- Exhaust fans
- Sheet metal, Ductwork
- Diffusers and Grilles
- Duct accessories, including grilles, and louvers
- Air Test and Balance

1.3 COORDINATION

A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, even in areas where only mechanical work is to take place.

B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.

C. Work shall take place with minimal disruption to Owner’s operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to mechanical equipment.

F. Mechanical Contractor is responsible for all control wiring including thermostat(s). This includes all conduit, wire, and accessories both low voltage and source voltage for the controls' system. Mechanical Contractor will provide all the necessary actuators, relays, software, hardware, and all necessary accessories required for a fully functional controls' system.

1.4 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.

2. Obtain any approvals required from utilities to relocate utilities.

3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.5 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.

2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.

2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.

3. Temporary fencing around equipment while site work is in progress.

1.6 SUBMITTALS

1. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire mechanical or plumbing in a bound enclosure. This will eliminate delays in the submittal process.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Nonshrink grout for equipment installations.
9. Field-fabricated metal and wood equipment supports.
10. Installation requirements common to equipment specification sections.
11. Cutting and patching.
12. Touchup painting and finishing.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

G. PVC: Polyvinyl chloride plastic.

H. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

B. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.

2. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.

3. Sizes and location of required concrete pads and bases.

4. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

5. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes, ductwork, equipment, and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in architectural section.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.8 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments, and complete punch list items before final acceptance by the Owner.

C. The date of acceptance by the Engineer, for beneficial use by the Owner, shall be the beginning date of the warranty period.

1.9 SPACE AND EQUIPMENT ARRANGEMENT

A. The size of each item of mechanical equipment shown on the Drawings is based on the dimensions of a particular manufacturer as indicated. While other manufacturers may be acceptable, it shall be the responsibility of the Contractor to determine whether or not the equipment he proposes to furnish will fit into the space. Shop drawings shall be prepared when required by the engineer to indicate a suitable arrangement.

B. Install equipment in a manner to permit access to all surfaces. Install valves, motors, drives, lubricating devices, filters, and other accessory items in a position to allow removal for service without requiring the disassembly of another part.

C. Provide access panels acceptable to the Engineer for equipment that is concealed above ceiling space.

D. Large equipment assemblies or components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is completed. Provisions shall be implemented by the Contractor to insure that the equipment will not be damaged in any way during the associated construction procedures.

1.10 START-UP OF EQUIPMENT AND SYSTEMS

A. Whenever the manufacturer of a particular item of equipment or a particular system makes available a start-up service after completion of the installation, such manufacturer's start-up service (rendered by the manufacturer or his authorized representative) shall be provided.

B. Witnessing and explanations of start-up services shall be included as part of the "Instruction of Owner's Personnel" as specified below.

1.11 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers or technicians acceptable to the Engineer to instruct representatives of the Owner in complete and detailed operation and maintenance of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include piping diagrams, valve identification charts, control and interlocking wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.

D. Provide the Owner with three (3) complete sets of all maintenance manuals, pamphlets, brochures or instructions. This material shall be catalogued, indexed and bound into books.

1.12 ACCEPTABLE MANUFACTURERS

A. A. Provide equipment and materials from listed manufacturers listed within this specification. Deviations from this specification will not be acceptable. When one manufacturer is listed, alternate materials and equipment may be provided "equal to" the listed. When more than one manufacturer is listed, equipment and material must be provided by one of the listed manufacturers.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS

A. Each item of equipment furnished under this Division of the Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of equipment are required, these shall be the products of a single manufacturer; however, the component parts of the equipment need not be the products of one manufacturer.

B. Materials and equipment shall be of the base quality normally used in good commercial practice, and shall be the products of reputable domestic manufacturers unless otherwise specified. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

2.2 QUALITY AND CLASSIFICATION OF MATERIALS

A. Materials and equipment shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials or equipment identical with those damaged.

B. Wherever a UL standard has been established for a particular type of material or equipment, each such material or equipment provided on this project shall meet the requirements of the UL standard in every way and shall be UL listed and labeled.

2.3 LOCAL PARTS AND SERVICE

A. Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. “Local” shall be defined, for this purpose, as “within 50 miles of the project site.”

2.4 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials used for insulation, acoustical linings, adhesives, jackets and coatings, and combinations of these materials, shall each have a flame spread rating of 25 or less, and a smoke developed rating of 50 or less, as determined by an independent testing laboratory in accordance with NFPA-255.

2.5 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

   a. Watts Industries, Inc.; Water Products Div.

   b. Zurn Industries, Inc.; Wilkins Div.

2. Mechanical Sleeve Seals:

   a. Calpico, Inc.

   b. Metraflex Co.

c. Thunderline/Link-Seal.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

a. Underdeck Clamp: Clamping ring with set screws.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.

2. OD: Completely cover opening.

3. Cast Brass: One piece, with set screw.

a. Finish: Rough brass.

b. Finish: Polished chrome-plate.

4. Cast-Iron Floor Plate: One-piece casting.

2.8 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psig, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.

2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.

5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.

    b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.

5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe or pipe insulation and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.

3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."

4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

   a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

   b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.

   c. Align threads at point of assembly.

   d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

   e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

   a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

   b. PVC Nonpressure Piping: ASTM D 2855.

   c. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

   a. Plain-End Pipe and Fittings: Use butt fusion.

   b. Plain-End Pipe and Socket Fittings: Use socket fusion.

W. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT AND MATERIAL INSTALLATION - COMMON REQUIREMENTS

A. Install equipment and material to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment and ductwork giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 PAINTING AND FINISHING

A. Refer to paint materials, surface preparation, and application of paint.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement or as specified.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.7 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION

SECTION 23 05 29
HANGER & SUPPORTS FOR HVAC PIPING & EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
.3 Section 03 30 00 - Cast-in-Place Concrete.
.4 Section 05 12 23 - Structural Steel for Buildings.
.5 Section 05 50 00 - Metal Fabrications.

1.3 REFERENCES

.1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
.2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)
.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS).

.1 Materials Safety Data Sheets (MSDS).

.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacture.
.2 ANSI/MSS SP-69, Pipe Hangers and Supports - Selection and Application.
.3 MSS SP-89, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC)

1.4 SYSTEM DESCRIPTION

.1 Design Requirements

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
.2 Base maximum load ratings on allowable stresses prescribed by MSS SP58 or ASME B31.1.
.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP58.

.2 Performance Requirements

.1 Design supports, platforms, catwalks, hangers, to withstand seismic events for location as per the National Building Code

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.2 Shop drawings: submit drawings stamped and signed for approval by Owner’s Representative.
.3 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.

.1 Owner’s Representative will make available 1 copy of systems supplier's installation instructions.

.5 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

1.6 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP-58 and SP-89.
.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized painted with zinc-rich paint after manufacture.
.2 Use electro-plating galvanizing process or hot dipped galvanizing process.
.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: Suspension from lower flange of I-Beam.

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed, 13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater, hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed, FM approved where required to MSS-SP58 and MSS-SP69.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved where required to MSS SP69.
.2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed, FM approved where required.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed FM approved where required to MSS SP-69.

.5 Shop and field-fabricated assemblies.

.1 Trapeze hanger assemblies: MSS SP-89.
.2 Steel brackets: MSS SP-89.
.3 Sway braces for seismic restraint systems: to MSS SP-89.

.6 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.
.2 Provide linkages where lateral or axial movement of pipework is anticipated.
.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel galvanized.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation saddles for hot pipework.
.4 Oversize pipe hangers and supports for insulated pipes.

.8 Adjustable clevis: material to MSS SP-69, UL listed FM approved, where required clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-69.
.10 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: galvanized.
.2 Finishes for copper, glass, brass or aluminum pipework: black with formed portion plastic coated or epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized black carbon steel to MSS SP-58, type 42, UL listed FM approved where required.
.2 Copper pipe: carbon steel copper plated to MSS SP-58, type 42.
.3 Bolts: to ASTM A307.
.4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-69.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report(CMTR).
.2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
.3 Provide upper and lower factory set travel stops.
.4 Provide load adjustment scale for field adjustments.
.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
.3 Variable spring hanger to be complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.
.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings. Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.9 PLATFORMS AND CATWALKS

.1 To Section 05 50 00 - Metal Fabrication.

2.10 HOUSE-KEEPING PADS

.1 For base-mounted equipment: Concrete, at least 100 mm high, 50 mm larger all around than equipment, and with chamfered edges.
.2 Concrete: to Section 03 30 00 - Cast-in-place Concrete by Division 3.

2.11 OTHER EQUIPMENT SUPPORTS

.1 From structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings.
.2 Submit structural calculations with shop drawings.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
.2 Bolt-tightening torques to be to industry standards.
.3 Steel pipes: Install below coupling or shear lugs welded to pipe.
.4 Cast iron pipes: Install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
.6 Use approved constant support type hangers where:

.1 vertical movement of pipework is 13 mm or more,
.2 transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 transfer of load to adjacent piping or to connected equipment is not critical.
.2 variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code
.2 Fire protection: to applicable fire code.
.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
.4 Copper piping: up to NPS 1/2: every 1.5 m.
.5 Hydronic, steam, condensate, rigid, and flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

Maximum Pipe Size: NPS	Maximum Spacing: Steel	Maximum Spacing: Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	

Maximum Pipe Size: NPS	Maximum Spacing: Steel	Maximum Spacing: Copper
10	6.6 m	
12	6.9 m	

.6 Within 300 mm of each elbow.
.7 Pipework greater than NPS 12: to MSS SP69.

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.
.2 Adjust hangers to equalize load.
.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members, comprised of angel iron or c-channel.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.
.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.
.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

SECTION 23 05 63
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.

2. Equipment markers.

3. Access panel and door markers.

4. Pipe markers.

5. Duct markers.

6. Valve tags.

1.3 SUBMITTALS

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

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

a. Manufacturer, product name, model number, and serial number.

b. Capacity, operating and power characteristics, and essential data.

c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.

2. Data:

a. Name and plan number.

b. Equipment service.

c. Design capacity.

d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.

2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.

4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.

5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.

2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme [approved by Architect] <Insert other>. Provide 5/32-inch (4-mm) hole for fastener.

1. Material: 3/32-inch- (2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.

2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Divisions. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Pumps, compressors, chillers, condensers, and similar motor-driven units.

2. Heat exchangers, coils, evaporators, and similar equipment.

3. Fans, blowers, primary balancing dampers, and mixing boxes.

4. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.

   b. Fire department hose valves and hose stations.

   c. Meters, gages, thermometers, and similar units.

   d. Pumps, compressors, chillers, condensers, and similar motor-driven units.

   e. Heat exchangers, coils, evaporators, and similar equipment.

   f. Fans, blowers, primary balancing dampers, and mixing boxes.

   g. Packaged HVAC central-station and zone-type units.

   h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

   a. Green: For cooling equipment and components.

   b. Yellow: For heating equipment and components.

   c. Orange: For combination cooling and heating equipment and components.

2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

4. Include signs for the following general categories of equipment:

   a. Main control and operating valves, including safety devices.

   b. Pumps, compressors, chillers, condensers, and similar motor-driven units.

   c. Heat exchangers, coils, evaporators, and similar equipment.

d. Fans, blowers, primary balancing dampers, and mixing boxes.

e. Packaged HVAC central-station and zone-type units.

f. Tanks and pressure vessels.

g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Pretensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.

2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

4. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches (38 mm), round.

b. Hot Water: 1-1/2 inches (38 mm), round.

c. Fire Protection: 2 inches (50 mm), round.

C. Valve-Tag Color:

a. Cold Water: Green.

b. Hot Water: Yellow.

c. Fire Protection: Red.

2. Letter Color:

a. Cold Water: White.

b. Hot Water: White.

c. Fire Protection: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING & BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.

2. Adjusting total HVAC systems to provide indicated quantities.

3. Measuring electrical performance of HVAC equipment.

4. Setting quantitative performance of HVAC equipment.

5. Verifying that automatic control devices are functioning properly.

6. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.2 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. CTI: Cooling Tower Institute.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing,

adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

C. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.4 QUALITY ASSURANCE

A. Agent Qualifications for larger projects: Engage a testing, adjusting, and balancing agent certified by AABC.

B. Agent Qualifications for smaller projects: Engage a testing, adjusting, and balancing agent certified by NEBB.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in specifications.

D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

5. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.

7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

8. Interlocked systems are operating.

9. Changeover from heating to cooling mode occurs according to design values.

N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Automatic temperature-control systems are operational.

3. Equipment and duct access doors are securely closed.

4. Balance, fire dampers are open.

5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

6. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section.

B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

   a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

   b. Measure static pressure directly at the fan outlet or through the flexible connection.

   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

2. Measure static pressure across each air-handling unit component.

   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

4. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

    a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating if high-efficiency motor.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.8 HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.

2. Airflow.

3. Entering- and leaving-air temperatures at full load.

4. Voltage and amperage input of each phase at full load and at each incremental stage.

5. Calculated kW at full load.

6. Fuse or circuit-breaker rating for overload protection.

3.9 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

3.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply and Exhaust Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.

3. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.12 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Fan curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of testing, adjusting, and balancing Agent who certifies the report.

10. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.

12. Data for terminal units, including manufacturer, type size, and fittings.

13. Notes to explain why certain final data in the body of reports vary from design values.

14. Test conditions for fans and pump performance forms, including the following:

a. Settings for outside-, return-, and exhaust-air dampers.

b. Conditions of filters.

c. Cooling coil, wet- and dry-bulb conditions.

d. Face and bypass damper settings at coils.

e. Fan drive settings, including settings and percentage of maximum pitch diameter.

f. Settings for supply-air, static-pressure controller.

g. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.

2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.

5. Terminal units.

6. Balancing stations.

F. Roof Top Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

a. Unit identification.

b. Location.

c. Make and type.

d. Model number and unit size.

e. Manufacturer's serial number.

f. Unit arrangement and class.

g. Discharge arrangement.

h. Sheave make, size in inches (mm), and bore.

i. Number of belts, make, and size.

j. Number of filters, type, and size.

2. Motor Data: Include the following:

a. Make and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

3. Test Data: Include design and actual values for the following:

    a. Total airflow rate in cfm (L/s).

    b. Total system static pressure in inches wg (Pa).

    c. Fan rpm.

    d. Discharge static pressure in inches wg (Pa).

    e. Preheat coil static-pressure differential in inches wg (Pa).

    f. Cooling coil static-pressure differential in inches wg (Pa).

    g. Heating coil static-pressure differential in inches wg (Pa).

    h. Outside airflow in cfm (L/s).

    i. Return airflow in cfm (L/s).

    j. Outside-air damper position.

    k. Return-air damper position.

    l. Discharge air temperature

G. Electric-Coil Test Reports: For electric duct coils, and electric coils installed in central-station air-handling units, include the following:

    1. Unit Data: Include the following:

        a. System identification.

        b. Location.

        c. Coil identification.

        d. Capacity in Btuh (kW).

e. Number of stages.

f. Connected volts, phase, and hertz.

g. Rated amperage.

h. Discharge air temperature

2. Test Data: Include design and actual values for the following:

a. Heat output in Btuh (kW).

b. Airflow rate in cfm (L/s).

c. Air velocity in fpm (m/s).

d. Entering-air temperature in deg F (deg C).

e. Leaving-air temperature in deg F (deg C).

f. Voltage at each connection.

g. Amperage for each phase.

H. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

2. Motor Data: Include the following:

a. Make and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).

c. Fan rpm.

d. Discharge static pressure in inches wg (Pa).

e. Suction static pressure in inches wg (Pa).

I. Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:

1. Unit Data: Include the following:

a. Unit identification.

b. Location.

c. Unit make and model number.

d. Manufacturer's compressor serial numbers.

e. Compressor make.

f. Compressor model and serial numbers.

g. Refrigerant weight in lb (kg).

2. Test Data: Include design and actual values for the following:

a. Entering-air, dry-bulb temperature in deg F (deg C).

b. Leaving-air, dry-bulb temperature in deg F (deg C).

c. Control settings.

d. Unloader set points.

e. Low-pressure-cutout set point in psig (kPa).

f. High-pressure-cutout set point in psig (kPa).

g. Suction pressure in psig (kPa).

h. Suction temperature in deg F (deg C).

i. Condenser refrigerant pressure in psig (kPa).

j. Condenser refrigerant temperature in deg F (deg C).

k. Oil pressure in psig (kPa).

l. Oil temperature in deg F (deg C).

m. Voltage at each connection.

n. Amperage for each phase.

o. The kW input.

p. Number of fans.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 23 06 01
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Access panel and door markers.
4. Pipe markers.
5. Duct markers.
6. Valve tags.

1.3 SUBMITTALS

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

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:
    a. Manufacturer, product name, model number, and serial number.
    b. Capacity, operating and power characteristics, and essential data.

c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.

2. Data:

a. Name and plan number.

b. Equipment service.

c. Design capacity.

d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.

2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.

4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.

5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.

2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme [approved by Architect] <Insert other>. Provide 5/32-inch (4-mm) hole for fastener.

1. Material: 3/32-inch- (2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.

2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Divisions. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Pumps, compressors, chillers, condensers, and similar motor-driven units.

2. Heat exchangers, coils, evaporators, and similar equipment.

3. Fans, blowers, primary balancing dampers, and mixing boxes.

4. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.

b. Fire department hose valves and hose stations.

c. Meters, gages, thermometers, and similar units.

d. Pumps, compressors, chillers, condensers, and similar motor-driven units.

e. Heat exchangers, coils, evaporators, and similar equipment.

f. Fans, blowers, primary balancing dampers, and mixing boxes.

g. Packaged HVAC central-station and zone-type units.

h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

a. Green: For cooling equipment and components.

b. Yellow: For heating equipment and components.

c. Orange: For combination cooling and heating equipment and components.

2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

4. Include signs for the following general categories of equipment:

   a. Main control and operating valves, including safety devices.

   b. Pumps, compressors, chillers, condensers, and similar motor-driven units.

   c. Heat exchangers, coils, evaporators, and similar equipment.

   d. Fans, blowers, primary balancing dampers, and mixing boxes.

   e. Packaged HVAC central-station and zone-type units.

   f. Tanks and pressure vessels.

   g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Pretensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.

2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

4. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches (38 mm), round.

b. Hot Water: 1-1/2 inches (38 mm), round.

c. Fire Protection: 2 inches (50 mm), round.

2. Valve-Tag Color:

a. Cold Water: Green.

b. Hot Water: Yellow.

c. Fire Protection: Red.

3. Letter Color:

a. Cold Water: White.

b. Hot Water: White.

c. Fire Protection: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

B. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.2 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

B. Deliver and store all insulation with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

C. Any installed insulation left temporarily incomplete shall be covered with protective material until final connections can be installed.

1.5 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

1.6 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.

b. Knauf FiberGlass GmbH.

c. Owens-Corning Fiberglas Corp.

d. Schuller International,Inc.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film

2.3 Field Applied Jacket

A. Foil and paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.

3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Install anchor pins and speed washers on sides and bottom of horizontal ducts and all sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

3. Impale insulation over anchors and attach speed washers.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

6. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.

7. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round duct elbows with individually mitered gores cut to fit the elbow.

8. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.

9. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply-, return-, and outside-air ductwork.

2. Indoor exposed supply-, return-, and outside-air ductwork.

3. Indoor concealed range-hood exhaust ductwork.

4. Indoor concealed dishwasher ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Factory-insulated flexible ducts.

2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.

3. Flexible connectors.

4. Vibration-control devices.

5. Testing agency labels and stamps.

6. Nameplates and data plates.

7. Access panels and doors in air-distribution systems.

3.6 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round and rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.

2. Thickness: 3 inches (R-8 or greater)

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

B. Service: Round and rectangular, return-air ducts, outside air duct, concealed or exposed.

1. Material: Mineral-fiber blanket.

2. Thickness: 2 inches (50 mm).

3. Number of Layers: One.

4. Field-Applied Jacket: Foil and Paper

5. Vapor Retarder Required: Yes.

C. Service: Round and rectangular, supply and return-air ducts, exposed and in mechanical rooms.

1. Material: 2" liner insulation

2. Thickness: 2 inches (50 mm).

3. Number of Layers: One.

4. Field-Applied Jacket: None.

5. Vapor Retarder Required: No

D. Service: Round and rectangular, exhaust air ducts, concealed & exposed and in mechanical rooms.

1. Material: 1" Interior liner

2. Thickness: 1 inches

3. Number of Layers: One.

4. Field-Applied Jacket: None.

5. Vapor Retarder Required: No

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:
   a. CertainTeed Manson.
   b. Knauf FiberGlass GmbH.
   c. Owens-Corning Fiberglas Corp.
   d. Schuller International, Inc.

2. Cellular-Glass Insulation:
   a. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

3. Flexible Elastomeric Thermal Insulation:
   a. Armstrong World Industries, Inc.
   b. Rubatex Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

   a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.

   b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.

2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Closed-Cell Phenolic-Foam Insulation: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.

D. Flexible Elastomeric Thermal Insulation used on Refrigerant Piping: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-(0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

D. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth finish, 0.010 inch (0.25 mm) thick.
2. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

E. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
1. Products:
   a. Pittsburgh Corning Corporation; Pittwrap.
   b. Polyguard; Insulrap No Torch 125.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

1. Aluminum: 0.007 inch (0.18 mm) thick.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow vale operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 CLOSED-CELL PHENOLIC-FOAM INSUALTION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with

weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Fire-suppression piping.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Condensate and equipment drain piping.

1. Operating Temperature: 40 to 60 deg F
2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
3. Insulation Thickness: 3/4”
4. Field-Applied Jacket: Aluminum.
5. Vapor Retarder Required: No.
6. Finish: Two coats of the insulation manufacturer’s recommended protective coating.

B. Service: Chilled-water supply and return.

1. Operating Temperature: 35 to 75 deg F
2. Insulation Material: Pre-insulated piping, or Cellular glass, with jacket or Closed-cell phenolic foam.
3. Insulation Thickness, Cellular glass: Apply the following insulation thickness:
   a. Steel Pipe, 1.5” and smaller: 1.5”
   b. Steel Pipe, 2” to 12”: 2”
4. Insulation Thickness, Closed-cell phenolic foam: Apply the following insulation thicknesses:
   a. Steel Pipe, 1.5” and smaller: 1”
   b. Steel Pipe, 2” to 4”: 1.5”
   c. Steel Pipe, 5” to 12”: 2”
5. Field-Applied Jacket: Aluminum on exposed ceiling , Aluminum Jacket on all exterior,
6. Vapor Retarder Required: Yes.
7. Finish: None.

C. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

D. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).

1. Operating Temperature: 35 to 90 deg F
2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
3. Insulation Thickness: larger of 1" or mfr's recommendations.
4. Field-Applied Jacket: scrim reinforced foil
5. Vapor Retarder Required: None.
6. Finish: None.

3.11 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses: ½"
4. Field-Applied Jacket: Aluminum
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Chilled-water supply and return.

1. Operating Temperature: 35 to 75 deg F
2. Insulation Material: Pre-insulated piping, or Cellular glass, with jacket or Closed-cell phenolic foam.
3. Insulation Thickness, Cellular glass: Apply the following insulation thickness:
   a. Steel Pipe, 1.5" and smaller: 1.5"
   b. Steel Pipe, 2" to 12": 2"
4. Insulation Thickness, Closed-cell phenolic foam: Apply the following insulation thicknesses:
   a. Steel Pipe, 1.5" and smaller: 1"
   b. Steel Pipe, 2" to 4": 1.5"
   c. Steel Pipe, 5" to 12": 2"
5. Field-Applied Jacket: Aluminum
6. Vapor Retarder Required: Yes.
7. Finish: None.

END OF SECTION

SECTION 23 26 00
CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Coordinate installation of condensate drain piping with Section 22 0501 as described in Contract Documents.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Materials:

1. Condensate Drains:

a. Exterior And Interior Lines: Schedule 40 Galvanized Pipe

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condensate Drains:

1. Support piping and protect from damage.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

B. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect.

1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Duct layout indicating pressure classifications and sizes on plans.

2. Fittings.

3. Penetrations through fire-rated and other partitions.

4. Coordination with other trades and including but not limited to: structural members, electrical lights and conduits, plumbing lines, & fire sprinkler lines.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.

2. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Duct Construction Standards: Provide a copy of the duct construction standards to be used for each pressure classification in this project. Duct Construction Standards must comply with the latest edition of SMACNA “HVAC Duct Construction Standards – Metal and Flexible.”

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation

D. Deliver and store all ductwork with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

E. Any installed ductwork or piping system left temporarily incomplete shall be covered with protective material until final connections can be installed.

F. All ductwork and/or liner insulation to be wrapped with protective material until installation. Any ductwork or insulation left exposed to the environment or contaminating particulate matter shall be replaced at the contractor’s expense.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Comply with latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Fabricate range hood exhaust ducts with 0.0598-inch- thick, galvanized sheet for concealed ducts and 0.0500-inch- thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.

C. Fabricate dishwasher hood exhaust ducts with 0.0500-inch- thick stainless steel. Weld and flange seams and joints.

D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:

1. Supply Ducts between AHU and Air Terminal Units: 3-inch wg.

2. Supply Ducts after air terminal units and on constant volume supply equipment: 1-inch wg (250 Pa), positive pressure

3. Return Ducts: 1-inch wg ,negative pressure.

4. Exhaust Ducts: 1-inch wg negative pressure.

E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.5 ROUND FABRICATION

A. Round Ducts: Fabricate spiral seam supply and return ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Snap Lock Longitudinal seam ductwork will not be allowed. Adjustable elbows will not be allowed.

B. Spiral seam round or oval duct may be substituted for rectangular duct at the contractors option. Spiral seam ductwork sizing must result in the same or less pressure drop than the rectangular duct indicated on the plans.

2.6 DUCT STORGE

A. All duct must have end capped with plastic covers on both ends from end of fabrication to duct installation. If this is not provided at the field, vacuum ducts before final acceptance to remove dust and debris.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round ducts in lengths not less than 10 feet (3 m), unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division Section "Duct Accessories." Firestopping materials and installation methods are specified in other Divisions

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." All duct to be sealed to SMACNA seal class A which requires sealing all transverse joints, longitudinal seams and duct wall penetrations regardless of pressure classification.

B. Seal externally insulated ducts before insulation installation.

C. All ducts shall be inspected after sealing is complete and prior to insulation installation. Provide the engineer with a minimum 7 days notice prior to beginning duct insulation.

3.3 RANGE HOOD EXHAUST DUCT INSTALLATIONS

A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.

B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at 15-foot intervals; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies.

3.4 DISHWASHER EXHAUST DUCT INSTALLATIONS

A. Install dishwasher exhaust ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.5 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.6 CONNECTIONS

A. Connect equipment with flexible connectors according to Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.7 DUCT APPLICATION

A. Service: Round and rectangular, supply/return/outside -air ducts, concealed.

B. Sheet-metal with wrap insulation

C. Service: Round and rectangular, supply/return/outside -air ducts, exposed and in mechanical rooms.

1. Sheet-metal double wall with lined insulation in-between.

2. Inner sheet-metal duct shall be perforated in areas with acoustical requirements, ref. plans.

3.8 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. 25% of the duct installed after the air handling units and (prior to the air terminal units, when applicable) shall be tested in the presence of the Architect, at static pressures equal to maximum design pressure of system or section being tested. The sections of duct to be tested shall be chosen by the architect or engineer after installation of the duct. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

E. Remake leaking joints and retest until leakage is less than maximum allowable.

3.9 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system.

END OF SECTION

SECTION 23 33 00
HVAC DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Flexible connectors.
8. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Duct-mounted access doors and panels.
5. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.

D. Blade Seals: Vinyl.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.

2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.

3. Blade Axles: Galvanized steel.

4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hours.

C. Fire Rating: One and one-half hours.

D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.

1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.

2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.

H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

I. Fusible Link: Replaceable, 165 deg F (74 deg C) rated as indicated.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.7 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

2.8 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.

2. Outer Jacket: Polyethylene film.

3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.9 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.

2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Division "Mechanical Identification."

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 23 33 46
FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:

1. National Fire Protection Association / American National Standards Institute:

a. NFPA 90A: ‘Standard for the Installation of Air-Conditioning and Ventilating Systems' (2012 Edition).

2. Underwriters Laboratories:

a. UL 181, ‘Factory-Made Ducts and Air Connectors' (10th Edition).

b. UL 181B, ‘Closure Systems for Use With Flexible Air Ducts and Air Connectors' (3rd Edition).

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:

a. Anco Products Inc,

b. Thermaflex by Flexible Technologies

c. Flexmaster USA Inc, Houston, TX

B. Materials:

1. Ducts:

a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.

b. Insulation:

1) Nominal 1-1/2 inches (38 mm), 3/4 lb per cu ft (12 kg per cu m) density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.

c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.

d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

1) ANCO-FLEX 4625 by Anco Products.

2) M-KC by Thermaflex by Flexible Technologies.

3) Type 4m Insulated by Flexmaster.

2. Cinch Bands: Nylon, 3/8 inch removable and reusable type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct in fully extended condition free of sags and kinks, using 60 inch maximum lengths.

B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

SECTION 23 34 23
CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes centrifugal fans and vent sets.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA standards.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each unit scheduled and include the following:

1. Certified fan performance curves with system operating conditions indicated.

2. Certified fan sound-power ratings.

3. Motor ratings and electrical characteristics, plus motor and electrical accessories.

4. Material gages and finishes, including color charts.

5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in specifications.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural support members and/or shaft locations.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in these documents.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cook, Loren Company.

2. Greenheck.

2.2 HOUSINGS

A. Roof Mounted Centrifugal Exhaust Fan.

1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These

components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

2.3 WHEELS

A. Roof Mounted Centrifugal Exhaust Fan

1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

2.4 SHAFTS

A. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

B. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.

C. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

2.5 BEARINGS

A. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.

2. Roller-Bearing Rating Life: ABMA 11, L_{50} of 200,000 hours.

2.6 BELT DRIVES

A. Description: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor: 1.5.

B. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

C. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

D. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

E. Motor Mount: Adjustable for belt tensioning.

2.7 ACCESSORIES

A. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.

B. Companion Flanges: Galvanized steel, for duct connections.

C. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.

D. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.

E. Spark-Resistant Construction: AMCA 99 (where required).

F. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

G. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.8 MOTORS

A. Refer to Section "Motors" for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, high efficiency, Design B.

C. Enclosure Type: [Open dripproof] [Totally enclosed, fan cooled].

2.9 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Install units with clearances for service and maintenance.

C. Label fans according to requirements specified in Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Verify lubrication for bearings and other moving parts.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.

2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

2. Review data in maintenance manuals. Refer to specifications Section "Closeout Procedures."

3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 23 37 13
DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.2 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.3 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.

2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus.

2. Price

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. Coordinate device locations with ceiling grid,

sprinklers, and lights. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 26 00 00
ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Specification Sections and other Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.
B. General Scope of Work:
1. Providing new panels, feeders, conduits, disconnect, fire alarm, rough-in for telephone and data system, and new light fixtures.

1.4 COORDINATION

A. All electrical work shall be done under sub-contract to a General Contractor. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.

B. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

C. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

D. Fully coordinate with mechanical contractor for providing power to mechanical equipment.

1.5 UTILITIES

1. Coordinate with power company and provide conduit, and trenching from transformer to power source. Coordinate with water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-

site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

1. To extradite the submittal process more efficiently, do not piece-meal the submittals. Submit entire electrical in a bound enclosure. This will eliminate delays in the submittal process. Unbound submittals shall be returned without review. Submit 10 copies minimum.

END OF SECTION

SECTION 26 01 20
OPERATION AND MAINTENANCE OF LOW-VOLTAGE ELECTRICAL DISTRIBUTION

PART1- GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, Specification Sections and all relevant documents shall form a part of this Section of the Specifications, and shall be incorporated in this Section and each Section 260000 hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Section. Certain specific paragraphs of said references may be referred to hereinafter in this Section. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.

B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Section shall not be used as a basis for a request for additional compensation.

C. The specific features and details for other portions of the work related to the construction in progress or to the adjacent building shall be determined by examination at the site.

1.2 SCOPE OF WORK

A. The requirements contained in this Section apply to all work performed under these Specifications.

B. The work covered by this Section of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.

C. Refer to other Sections of the Specifications for related work.

1.3 DEFINITION OF "CONTRACTOR"

A. Where the word "Contractor" is used under any Section of this Section of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section, even though this Contractor may be technically described as a Subcontractor, or an authorized representative.

B. If the Contractor, engaged to execute a portion of the work, employs a Subcontractor to perform some of that work, he shall be completely responsible for the proper execution of this Subcontractor’s work, in full conformity with the Contract Documents.

1.4 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor shall be responsible for all work of every description in connection with this Section of the Specifications. The Contractor shall specifically and distinctly assume, and does zeso assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.

B. The Contractor will be held responsible for the satisfactory execution and completion of the work in accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, the Contractor shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

1.5 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described be furnished, installed and connected under this Section, complete for operation, unless specifically noted to the contrary.

B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and devices described and specified under this Section of the Specifications be similarly furnished, installed and connected under this Section, whether or not a phrase as described in the preceding paragraph has been actually included.

C. Whenever the words “Owner’s Representative” occurs, it is intended to refer to the Architect, Engineer and/or specific Owner’s Representative responsible for or capable of providing the necessary direction pertaining to the referenced issue.

1.6 ORDINANCES, PERMITS AND CODES

A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.

B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.

C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.

D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.

E. The work shall be in accordance with, but shall not be limited to, the requirements of:

1 National Fire Protection Association

2 National Electrical Code

3 National Safety Code

4 State of Texas Safety Code

5 Local City Building Codes

6 State of Texas Building Codes

F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

1.7 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION

A. Materials, equipment and devices shall be of the best quality customarily applied in quality commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

B. Materials, equipment and devices furnished under this Section of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.

C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.

D. Space allocations for materials, equipment and devices have been made on the basis

of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

1.8 QUALITY ASSURANCE

A. Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with those damaged, unless specifically approved otherwise by the Owner's Representative.

B. Wherever a UL standard has been established for a particular type of material, equipment or device, each item of such material, equipment or device provided on this project shall meet the requirements of the UL standard in every way, and shall be UL listed and labeled.

1.9 REFERENCE STANDARDS

A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.

B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.

C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM	-	American Association of Battery Manufacturers
ADA	-	American’s with Disabilities Act
AIA	-	American Institute of Architects
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials

CBM	-	Certified Ballast Manufacturers Association
ETL	-	Electrical Testing Laboratories
FM	-	Factory Mutual
ICEA	-	Insulated Cable Engineers Associated
IEEE	-	Institute of Electrical and Electronic Engineers
IES	-	Illuminating Engineering Society
IRI	-	Industrial Risk Insurance
NBS	-	National Bureau of Standards
NEC	-	National Electrical Code
NECA	-	National Electrical Contractors Association
NEMA	-	National Electrical Manufacturers Association
NESC	-	National Electrical Safety Code
NETA	-	National Electrical Testing Association
NFPA	-	National Fire Protection Association
UL	-	Underwriters Laboratories

1.10 DRAWINGS AND SPECIFICATIONS

A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:

1 The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.

2 The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.

B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though called for by both. Resolution of conflicts between Drawings and Specifications

shall be as follows:

1 If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated for a complete operable system. Contractor is responsible to notifying the Architect and Engineer. In the event of this type of disagreement, the resolution shall be determined by the Owner's Representative. The contractor shall assume for an operable system at the most expensive combination as per the latest National Electrical Code. The contractor shall review all drawings and specifications prior to bid date.

2 The Contractor shall be responsible for bringing any conflicts in the Drawings and the Specifications to the attention of the Owner's Representative immediately, prior to bid date.

3 In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.

4 Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.

5 Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.

6 Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.

C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.

D. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Owner's Representative for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.

E. Review the construction details of the building(s) as illustrated on the Drawings of the other portions of the work, i.e., architectural, structural, civil, landscape, etc., and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.

F. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements.

Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. In cooperation with other Contractors, determine the exact location of equipment and devices and connections thereto by reference to the submittals and rough-in drawings, and by measurements at the site. Make minor relocations necessitated by the conditions at the site, or directed by the Owner's Representative, without additional cost to the Owner.

G. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings as required for all critical areas illustrating the installation of the work in this Section as related to the work of all other Sections and correct all interferences with the other portions of the work or with the building structures before the work proceeds.

H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installation or installing any new or temporary work under this Section.

1.11 SUBMITTALS

A. Submit product data and shop drawings in accordance with the Specifications.

B. Process product data and shop drawings to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.

C. Submittals shall be provided for review and approval on all systems, equipment, devices and materials proposed for use on this project. Submittals shall include, but not be limited to, the following:

1 Lighting and Appliance Panelboards

2 Disconnect Switches

3 Circuit Breakers and Fuses

4 Materials: conduit, conductors, connectors, supports, etc.

5 Lighting Fixtures, Lamps and Control Systems/Devices

6 Wiring Devices

7 Transformers

8 Distribution Panelboards

9 Motor Control Center

10 As indicated on each submittal section

D. The product data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.

E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.

F. Assemble submittals on related items procured from a single manufacturer in bound brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.

G. Prepare shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Owner's Representative. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.

H. The Contractor shall sign the submittal as an indication of compliance with the Contract Documents. If there are any deviations from the Contract Documents, he shall so indicate on the submittal. Any deviations not so indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor’s expense.

1.12 SUBSTITUTIONS

A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.

B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.

C. Manufacturers not listed will be considered for substitution prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum seven (7) business days prior to bid with each sub-paragraph noted with the comment, "compliance", "deviation", "alternate" or “not applicable”. In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated.

1 By noting the term "compliance" or "C", it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.

2 By noting the term "deviation" or "D", it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.

3 By noting the term "alternate" or "A", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.

4 By noting the term “not applicable” or “N/A”, it shall be understood that the specified item is not applicable to the project.

D. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.

E. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Owner's Representative, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.

F. The Owner's Representative reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.

G. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

1.13 INSTALLATION DRAWINGS

A. Prepare installation drawings for coordinating the work of this Section with the work of other Sections, to illustrate its concealment in finished spaces, to avoid obstructions,

and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.

B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not for approval, to the Owner's Representative for his information, review and record.

1.14 WORKMANSHIP AND INSTALLATION

A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.

B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about results of a first class condition.

C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

1.15 INSPECTION OF SITE

A. The accompanying drawings do not indicate existing installations other than to identify modifications of and extensions thereto. The Contractor shall visit the site, inspect the installations and ascertain the conditions to be met and the work to be performed. Failure to comply with this shall not constitute ground for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work under this Section.

B. Review construction details of the adjacent building presently under construction during the site inspection and include all work required to modify the existing installations and install new materials, comprising a part of the installation. Review all construction details of the new building as illustrated on the drawings and be guided thereby.

1.16 WARRANTY

A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Owner's Representative for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The

Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.

B. The Contractor shall furnish to the Owner's Representative for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

1.17 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

1.18 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers and/or technicians acceptable to the Owner's Representative to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

1.19 SCHEDULE AND SEQUENCE OF WORK

A. The Contractor shall meet and cooperate with the Owner and Owner's Representative to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

1.20 INSTALLATION INSPECTIONS AND CERTIFICATIONS

A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.

B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Owner's Representative for transmission to the Owner.

1.21 EQUIPMENT INSTALLATION

A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.

B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.

C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

1.22 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for all floor mounted equipment, unless noted or required otherwise.

B. All pads shall be not less than 3-1/2" high and extend a maximum 3" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Pads shall be poured in forms built of new dressed lumber with corners chamfered using sheet metal or triangular wood strips nailed to the form. Use 6 x 6 No. 3 mesh for reinforcing. Install heavy duty adjustable anchor bolts, set in the form and positioned using templates, prior to pouring concrete. After the equipment is set on the pad, the equipment shall be aligned, leveled and fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.

C. Perform all concrete work specified to be provided under this Section in strict accordance with the applicable provisions of Section, CONCRETE.

1.23 SLEEVES

A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.

B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6

inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.

C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked and filled with an asphalt-base compound to insure a waterproof penetration. Jute twine caulking shall not be used due to susceptibility to termite infestation.

1.24 ESCUTCHEONS

A. In each finished space, provided a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.

B. Size escutcheons and collars to fit snugly around conduit and rods.

C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

1.25 ACCESS PANELS

A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable suspended ceilings.

B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

1.26 SEALING OF PENETRATIONS

A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:

1 Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).

2 Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.

3 Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.

B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove free liquid and oil from penetration surfaces.

C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.

D. In addition to the Dow Corning products, equal products by Spec Seal Firestop Products, 3M Fire Barrier or CS240 Firestop are acceptable.

1.27 PROTECTION OF APPARATUS

A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Owner's Representative will be sufficient cause for the rejection of the pieces of apparatus in question.

B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Section of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.

C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

1.28 INSTALLATION OF CONTROL AND OPERATING DEVICES

A. The highest operable part of controls (light switches, dimmer switches, emergency power off devices, etc.), receptacles (electrical and communications) and other operable devices shall be 48" above finish floor. The lowest operable part shall be no less than 15" above finished floor. For purposes of uniformity, unless noted otherwise, the top of a device shall be maximum 48" AFF and the bottom of a device shall be minimum 15" AFF. Refer to the electrical symbols list on the Drawings for specific requirements.

B. Visual alarm appliances shall be placed 80" above finished floor (the highest floor level within a space) or 6" below the ceiling, whichever is lower.

1.29 INSTALLATION AND CONNECTION OF OTHER SECTION'S EQUIPMENT

A. Verify the electrical requirements of all equipment furnished under other Sections, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. The location of power, data and telephone outlets, wall switches and other related devices

may be relocated at the Owner's option, at no

additional cost to the Owner, to a point within10 feet of their present location provided the Contractor is notified prior to installation.

1.31 COOPERATION AND CLEAN-UP

A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.

B. After he installation is complete and before the equipment is energized, clean the interior and exterior of all equipment thouroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with lemon-oil rag after all other cleaning is complete. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER

A. The Contractor shall obtain at his own expense a complete set of blueline prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The Contractor shall record up to date information at least once a week and retain the set of prints on site for periodic review by the Architect/Engineer. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. If the Contractor prepared large scale installation drawings of electrical rooms, conduit routing, busduct, routing, etc., these drawings or reproducible sepias therefrom shall be revised as required to accurately illustrate the actual installation. All conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location.

B. Upon anticipated completion of the job, obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these record drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. This information shall be delivered prior to final acceptance.

C. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the

Owner's Representative for review and subsequent delivery to the Owner prior to final acceptance.

1 Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.

2 Approved lighting fixture brochures, wiring diagrams and control diagrams.

3 Copies of approved submittals and shop drawings.

4 Operating instructions and recommended maintenance procedures for major apparatus.

5 Copies of all other data and/or drawings required during construction.

6 Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.

7 Tag charts and diagrams hereinbefore specified.

1.33 FINAL OBSERVATION

A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.

B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Owner's Representative to make a final observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

1.1 GENERAL

1.2 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.3 SUMMARY

This Section includes the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete equipment bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

1.4 DEFINITIONS

EMT: Electrical metallic tubing.

FMC: Flexible metal conduit.

IMC: Intermediate metal conduit.

LFMC: Liquidtight flexible metal conduit.

RNC: Rigid nonmetallic conduit.

1.5 SUBMITTALS

Product Data: For electricity-metering equipment.

Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.

Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

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.

Comply with NFPA 70.

1.7 COORDINATION

Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

Coordinate electrical service connections to components furnished by utility companies.

2. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
3. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Section "Access Doors."

Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

1.8 PRODUCTS

1.9 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

Meter Sockets: Comply with requirements of electrical power utility company.

Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.

1. Housing: NEMA 250, Type 3R enclosure.
2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity,
3. minimum.

1.10 CONCRETE BASES

Concrete Forms and Reinforcement Materials: As specified in Section "Cast-in-Place Concrete."

Concrete: 3000-psi, 28-day compressive strength as specified in Section "Cast-in-Place Concrete."

1.11 TOUCHUP PAINT

For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY AND CABLE INSTALLATION

Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

Use temporary raceway caps to prevent foreign matter from entering.

Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

Dry Locations: Steel materials.

Support Clamps for PVC Raceways: Click-type clamp system.

Selection of Supports: Comply with manufacturer's written instructions.

Strength of Supports: Adequate to carry present and future loads, times a safety factor of at

least four; minimum of 200-lb design load.

3.4 SUPPORT INSTALLATION

Install support devices to securely and permanently fasten and support electrical components.

Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

Install 1/4-inch-diameter or larger threaded steel hanger rods, unless otherwise indicated.

Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

Simultaneously install vertical conductor supports with conductors.

Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 IDENTIFICATION MATERIALS AND DEVICES

Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

Self-Adhesive Identification Products: Clean surfaces before applying.

Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Colors: As follows:

    a. Fire Alarm System: Red.
    b. Security System: Blue and yellow.
    c. Telecommunication System: Green and yellow.

Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

4. Phase A: Black.
5. Phase B: Red.
6. Phase C: Blue.
7. Neutral: White.
8. Ground: Green.

Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

9. Phase A: BROWN.
10. Phase B: ORANGE.
11. Phase C: YELLOW.
12. Neutral: White with a colored stripe or gray.
13. Ground: Green.

Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch-high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.7 FIRESTOPPING

Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Section "Firestopping."

3.8 CONCRETE BASES

Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

3.9 CUTTING AND PATCHING

Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

Inspect installed components for damage and faulty work, including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.

10. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
11. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
12. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
13. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
14. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.11 REFINISHING AND TOUCHUP PAINTING

Refinish and touch up paint. Paint materials and application requirements are specified in Section "Painting."

Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

1. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
3. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

1. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
2. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTOR AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wires and Cables:

   a. American Insulated Wire Corp.; Leviton Manufacturing Co.

   b. BICC Brand-Rex Company.

   c. Carol Cable Co., Inc.

   d. Senator Wire & Cable Company.

   e. Southwire Company.

2. Connectors for Wires and Cables:

   a. AMP Incorporated.

   b. General Signal; O-Z/Gedney Unit.

   c. Monogram Co.; AFC.

   d. Square D Co.; Anderson.

e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Rubber Insulation Material: Comply with NEMA WC 3.

C. Thermoplastic Insulation Material: Comply with NEMA WC 5.

D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

E. Conductor Material: Copper.

F. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

G. Plenum rated cable for all cables above the ceiling.

2.3 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW or THWN, in raceway.

B. Feeders: Type 75C insulation THHN/THWN, in raceway.

C. Fire-Pump Feeder: Type MI, 3-conductor.

D. Branch Circuits: Type THHN/THWN, in raceway.

E. Fire Alarm Circuits: Type THHN/THWN, in raceway.

F. Class 1 Control Circuits: Type THHN/THWN, in raceway.

G. Class 2 Control Circuits: Type THHN/THWN, in raceway.

H. Equipment or any device rated 100 amperes or less, conductor shall be rated 60C as per National Electrical Code.

I. Equipment or any device rated over 100 amperes, conductor shall be rated 75C as per National Electrical Code.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Remove existing wires from raceway before pulling in new wires and cables.

C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section "Basic Electrical Materials and Methods."

G. Seal around cables penetrating fire-rated elements according to Section "Firestopping."

H. Identify wires and cables according to Section "Basic Electrical Materials and Methods."

I. Identify wires and cables according to Section "Electrical Identification."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding and bonding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.

2. Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

A. Revise this Article to suit Project and office practice. Frequently, no product submittal is required for this Section.

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

C. Retain paragraph above if Product Data are required for each product specified. Retain paragraph below if Product Data are required only for selected products.

D. Product Data: For the following:

1. Ground rods.

2. Chemical rods.

3. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

E. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Retain paragraph and subparagraph below if Contractor or manufacturer selects testing agency. Delete if Contractor is allowed to perform ground-resistance testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

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:

B. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. See Editing Instruction No. 1 in the Evaluations for cautions about naming products and manufacturers.

2. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.

b. Boggs, Inc.

c. Chance/Hubbell.

d. Copperweld Corp.

e. Dossert Corp.

f. Erico Inc.; Electrical Products Group.

g. Framatome Connectors/Burndy Electrical.

h. Galvan Industries, Inc.

i. Hastings Fiber Glass Products, Inc.

j. Ideal Industries, Inc.

k. ILSCO.

l. Kearney/Cooper Power Systems.

m. Korns: C. C. Korns Co.; Division of Robroy Industries.

n. Lightning Master Corp.

o. Lyncole XIT Grounding.

p. O-Z/Gedney Co.; a business of the EGS Electrical Group.

q. Raco, Inc.; Division of Hubbell.

r. Robbins Lightning, Inc.

s. Salisbury: W. H. Salisbury & Co.

t. Superior Grounding Systems, Inc.

u. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

B. If only copper conductors are permitted in Division 16 Section "Conductors and Cables," delete paragraph below.

C. Material: copper.

D. Equipment Grounding Conductors: Insulated with green-colored insulation.

E. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

F. Grounding Electrode Conductors: Stranded cable.

G. Underground Conductors: stranded, unless otherwise indicated.

H. Sizes and types below are typical. Adjust to suit Project conditions and requirements.

I. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.

2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

J. Delete paragraph and subparagraphs below if use of aluminum conductors is not permitted.

K. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.

2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Copper-clad steel is most common. See Evaluations for discussion on where other materials might be more appropriate.

B. Ground Rods: Copper-clad steel.

1. Select paragraph above or paragraph and subparagraph below. Sectional types are used when rods longer than 10 feet (3 m) are installed.

2. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

C. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.

D. Test Wells: Provide handholes as specified in Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 APPLICATION

A. Delete paragraph below if only copper conductors are specified in Division 16 Section "Conductors and Cables."

B. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

C. In raceways, use insulated equipment grounding conductors.

D. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

E. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

F. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

G. Delete paragraph and subparagraphs below if grounding bus is not required, or edit to suit Project.

H. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

I. Edit below to suit Project.

J. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. NEC permits two basic types of equipment grounding conductors: metallic raceway or cable sheath as the conductor, or a separate equipment grounding conductor. The installation of an equipment grounding conductor provides an additional degree of safe operation when compared to relying on raceway as the conductor. Revise paragraphs and subparagraphs in this Article to suit Project.

B. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

C. Install equipment grounding conductors in all feeders and circuits.

D. Select paragraph above or paragraph and subparagraphs below.

E. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.

2. Lighting circuits.

3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

7. Armored and metal-clad cable runs.

F. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

G. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

H. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

I. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

J. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

K. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

L. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

M. Coordinate paragraph and subparagraphs below with Drawings and Specification Sections for systems referenced. Edit to suit Project.

N. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

O. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m)

long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. Coordinate paragraph and subparagraphs below with Drawings.

B. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

C. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

D. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

E. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

F. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

G. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

I. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Retain one of three paragraphs below.

B. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. NFPA 70 has minimum value of 25 ohms. See Evaluations for discussion on appropriate grounding resistance values. Values listed below are typical; adjust to suit Project conditions.

b. Equipment Rated 500 kVA and Less: 10 ohms.

c. Equipment Rated 500 to 1000 kVA: 5 ohms.

d. Equipment Rated More Than 1000 kVA: 3 ohms.

e. Substations and Pad-Mounted Switching Equipment: 5 ohms.

f. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.6 GRADING AND PLANTING

A. Delete below if inappropriate or if surface restoration work is covered on Drawings or in Division 2 Sections. Coordinate with Drawings.

B. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

B. Comply with this sections, as applicable. Refer to other sections for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of supporting devices, including related systems and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Unistrut Corp.

B. B-Line Systems, Inc.

C. Midland Ross-Kindorf

2.2 MATERIALS

A. Suspension Hangers

1. Suspension hangers for individual conduit runs shall be zinc plated formed steel type.

B. Vertical Supports

1. Malleable iron one hole pipe straps shall be used for vertical runs

C. Clamps

1. Beam clamps shall be used for bar joists and beams.

D. Anti-Vibration Hangers

1. Anti-vibration hangers shall be combination type having a double deflection neoprene element in series with a steel coil spring; double deflection of 0.30"; steel

coil spring shall be selected from a 1" static deflection series with a minimum additional travel to solid of ½"; spring diameters shall be large enough to permit 15 degree angular misalignment of the rod connecting the hanger to the ceiling support without rubbing the hanger box.

2.3 LIGHT FIXTURE HANGERS

A. Refer to Section 26 51 00

B. Corrosive Areas: PVC; at factory apply a minimum of 10-mil-thick PVC coating, bonded to metal, inside and outside.Z

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hangers

1. Approved hangers and stiff leg supports shall be installed in quantity and size as required to carry the weight of raceway and contents and shall be arranged to prevent vibration transmission to the building and allow for raceway movement.

2. Hangers shall be supported by means of uncoated solid steel rods which are threaded to allow vertical adjustments. Lock nuts shall be provided in sufficient number and location to lock all rod adjustments permanently at the adjusted height. Two lock nuts shall be used unless the nut tightens against a threaded socket. Minimum rod diameters shall be as follows:

B. NOMINAL CONDUIT SIZE ROD DIAMETER

1/2" through 2 1/4"

2-1/2" through 3 3/8" 4" and 5 1/2"

1. Hanger spacing shall be as required for proper and adequate support raceway, but in no case shall be less than one hanger per 8'-0" of raceway length except that conduit less than 1" diameter shall be supported at least every 6'-0".

2. Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.

3. Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

Supports

4. Support of hangers shall be by means of sufficient quantities of individual after set steel expansion shields, or beam clamps attached to structural steel.

5. Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.

6. Ceiling mounted lighting fixtures shall be supported from the building structure at two opposite corners. The Contractor shall provide fixture hangers to properly interface with the ceiling system.

7. Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.

8. Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.

9. Support of hangers from concrete tees shall be by means of sufficient quantity of angle iron brackets attached with after set expansion shields and bolts.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Edit lists below to suit Project.

2. Raceways include the following:

a. RMC.

b. IMC.

c. PVC externally coated, rigid steel conduits.

d. PVC externally coated, IMC.

e. EMT.

f. FMC.

g. LFMC.

h. LFNC.

i. RNC.

j. ENT.

k. Wireways.

l. Surface raceways.

3. Boxes, enclosures, and cabinets include the following:

a. Device boxes.

b. Floor boxes.

c. Outlet boxes.

d. Pull and junction boxes.

e. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:

1. List below only products and equipment for this Project that the reader might expect to find in this Section but are specified elsewhere. Verify that Section titles listed below are correct for this Project's Specifications because Section titles may have changed since this Section was updated.

2. Section "Basic Electrical Materials and Methods" for raceways and box supports.

3. Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RMC: Rigid metal conduit.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Delete below except for custom enclosures.

C. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

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:

B. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Conduit and Tubing:

    a. Alflex Corp.

    b. Anamet, Inc.; Anaconda Metal Hose.

    c. Anixter Brothers, Inc.

    d. Carol Cable Co., Inc.

    e. Cole-Flex Corp.

    f. Electri-Flex Co.

    g. Flexcon, Inc.; Coleman Cable Systems, Inc.

    h. Grinnell Co.; Allied Tube and Conduit Div.

    i. Monogram Co.; AFC.

    j. Spiraduct, Inc.

    k. Triangle PWC, Inc.

    l. Wheatland Tube Co.

2. Nonmetallic Conduit and Tubing:

    a. Anamet, Inc.; Anaconda Metal Hose.

b. Arnco Corp.

c. Breeze-Illinois, Inc.

d. Cantex Industries; Harsco Corp.

e. Certainteed Corp.; Pipe & Plastics Group.

f. Cole-Flex Corp.

g. Condux International; Electrical Products.

h. Electri-Flex Co.

i. George-Ingraham Corp.

j. Hubbell, Inc.; Raco, Inc.

k. Lamson & Sessions; Carlon Electrical Products.

l. R&G Sloan Manufacturing Co., Inc.

m. Spiraduct, Inc.

n. Thomas & Betts Corp.

3. Conduit Bodies and Fittings:

a. American Electric; Construction Materials Group.

b. Crouse-Hinds; Div. of Cooper Industries.

c. Emerson Electric Co.; Appleton Electric Co.

d. Hubbell, Inc.; Killark Electric Manufacturing Co.

e. Lamson & Sessions; Carlon Electrical Products.

f. O-Z/Gedney; Unit of General Signal.

g. Scott Fetzer Co.; Adalet-PLM.

h. Spring City Electrical Manufacturing Co.

4. Metal Wireways:

a. Hoffman Engineering Co.

b. Keystone/Rees, Inc.

c. Square D Co.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw type.

E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Select 1 of 4 paragraphs below.

E. Wireway Covers: Screw – cover type flanged-and-gasketed type.

F. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Edit paragraph below. Aluminum is also available and suitable for use with steel raceways.

C. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.6 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panel-

boards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Use a comprehensive wiring method schedule on Drawings or use this Article to specify where various raceway types are to be installed. Edit examples below, adding or deleting materials and methods to suit Project. Coordinate with Division 16 Section "Wires and Cables." Do not duplicate information on Drawings, in NFPA 70, or in other Division 16 Sections. List exceptions to stated requirements. Check code to avoid specifying uses not permitted.

B. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R .

C. Indoors: Use the following wiring methods:

1. Exposed: EMT.
2. Concealed: EMT.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Select 1 of 2 subparagraphs below and add other specific box and enclosure requirements to suit Project.
   b. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Select paragraph above or below.

C. Minimum Raceway Size: 3/4-inch trade size (DN21).

D. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Install raceways level and square and at proper elevations. Provide adequate headroom.

G. Complete raceway installation before starting conductor installation.

H. Support raceways as specified in Section "Basic Electrical Materials and Methods."

I. Use temporary closures to prevent foreign matter from entering raceways.

J. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

K. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

L. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

M. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

N. Raceways Embedded in Slabs (Must be indicated on drawings to be embedded. Please notify Engineer if required but not shown): Install in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

O. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

P. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

Q. Tighten set screws of threadless fittings with suitable tools.

R. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

S. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

T. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

U. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

V. Delete paragraph below if not applicable.

W. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

X. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

Z. Delete paragraph below if no high-frequency installation.

AA. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.

BB. Do not install aluminum conduits embedded in or in contact with concrete.

CC. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

DD. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.

2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.

3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.

4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

EE. Set floor boxes level and adjust to finished floor surface.

FF. Select paragraph above for metal floor boxes and below for nonmetallic floor boxes.

GG. Set floor boxes level and trim after installation to fit flush to finished floor surface.

HH. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

II. NO PVC CONDUIT ALLOWED ABOVE THE CEILING OR IN THE A/C RETURN PLENUM. PROVIDE RIGID CONDUIT. Verify all MEP documents.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART1 -GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of all site electrical work.

B. The site electrical work shall include, but not be limited to, the furnishing and installation of necessary materials and making arrangements for:

1. The connection of electrical and telephone utilities.

2. Underground conduit.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Section for products specified under PARTS 2 PRODUCTS.

1.4 REFERENCE STANDARDS

A. National Electrical Code (NEC), Article 300

B. Service installation standards of the serving utility company(s).

PART 2 - PRODUCTS

2.1 ELECTRICAL SERVICE

A. Coordination: The location of the service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the electrical service. Contractor shall coordinate with the Power Company for all requirements prior to bid date. Contractor shall include all cost to for Utility Company to extend service to project site bid.

B. Materials: Provide materials in accordance with other Sections of these Specifications.

2.2 COMMUNICATION SERVICE

A. Coordination: The location of the telephone, cable, and internet service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the telephone, cable and internet services. Contractor shall coordinate with the Telephone ,

cable, and internet company for all requirements prior to bid date. Contractor is responsible to coordinate with utility companies.

B. Materials: Provide materials in accordance with other sections of this specification.

PART 3 - EXECUTION

3.1 GENERAL

A. Underground installation of more than one conduit shall be in a duct arrangement as indicated. All conduits shall be laid so joints are staggered. All bends and stub-ups shall be rigid steel.

B. Pour a red colored concrete envelope 3" thick over utility service, emergency generator and fire pump conduits. Where conduits cross a driveway, road or parking area, reinforcing rods shall be installed.

C. Perform excavation, shoring, backfilling and concrete work in connection with electrical work in accordance with other sections of the Specifications.

D. All conduit shall be sloped away from the building to negate water entering the building through the conduit system.

3.2 UTILITIES

A. The locations, elevations and voltage of electrical lines and the location of the telephone lines included within the area of this work are indicated on the Drawings or in the Specifications in accordance with information received by the Architect/Engineer and Owner.

B. The Contractor shall examine the site and shall verify, to his own satisfaction, the location and elevation of all utilities, and shall adequately inform himself as to their relation to the work.

C. Existing utility lines not indicated but encountered during construction shall be protected, relocated or capped as directed by the Architect/Engineer. All precautions shall be exercised to prevent damage to existing lines not shown, but should work become necessary, it must be authorized prior to execution except in an emergency situation.

D. Before beginning excavations of any nature whatsoever, the Contractor shall make an attempt to locate all underground utilities of every nature occurring within the bounds of the area to be excavated. Contractor is responsible to call 811 prior to any work. The Contractor shall then proceed with caution in his excavation work so that no utility shall be damaged with a resultant loss of service.

E. Should a damage result to any utility through the Contractor's negligence or failure to comply with the above directive, he shall be liable for such damage and for all expense incurred in the expeditious repair or replacement of such damaged utilities.

F. Repair of damaged utilities shall be to a condition equal to or better than the adjacent undamaged portion of such utility and to the complete satisfaction of the Architect/Engineer and Owner.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

B. Comply with ELECTRICAL Sections, as applicable. Refer to other sections for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of electrical identification, including related accessories.

B. Provide electrical identification for the following:

1. Panelboards, motor starters, contactors, disconnect switches, circuit breakers and other electrical equipment with nameplate identifying the item of equipment and the equipment serving the same.

2. Raceways, junction boxes and pull boxes.

3. Label each panelboard index indicating the room #s to the related circuit. Also add the index sheet in a laminated white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

4. Wiring devices.

5. Wiring.

6. Three phase motor rotation.

1.3 SUBMITTALS

A. Submit product data in accordance with Section for products specified under PART 2 - PRODUCTS.

PART 2 - PRODUCTS

1.1 ACCEPTABLE MANUFACTURERS

A. Brady

B. Panduit

C. Thomas & Betts

D. Seton

1.2 IDENTIFICATION

E. A. Nameplates

1. Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.

2. Provide for each distribution panelboard, branch circuit panelboard, transformer and any other similar equipment furnished under this section identification as to its given name, voltage and origination of service. Examples are as follows:

'LR1'	'LR2'
120/240V	120/240V
FED FROM 'MDP'	FED FROM 'MDP'

3. Provide for each motor starter enclosure, circuit breaker enclosure, disconnect switch and any other similar equipment furnished under this section, identification as to the specific load that it serves and the origination of service. Examples are as follows:

'AHU-1'	'CU-1'
FED FROM 'MDP'	FED FROM 'MDP'

4. Provide for each feeder protective device in each distribution panelboard and any other similar equipment furnished under this section, identification as to the specific load that it serves.

5. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

F. B. Junction Boxes and Pull Boxes

1. 1. Identification shall be with a black permanent marking pen on the top of 4" x 4" junction box covers or on the back of an outlet box cover plate identifying the branch circuits and systems within the conduit. Pull boxes shall be provided with a nameplate

stating voltage and system served.

G. C. Wiring Device Wall Plates

1. 1. On the back side of wiring device wall plates identify with a black permanent marking pen the panelboard and branch circuit number the device is served from.

H. D. Wire Markers

1. 1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.

I. Rotation Tags

1. Rotation tags shall be brass or aluminum securely attached to equipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

3.2 NAMEPLATES

J. A.Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this section.

3.3 WIRE MARKERS

K. A.Wire markers shall be applied to each conductor or cable within panelboards, motor starter enclosures, circuit breaker enclosures, disconnect switches, cabinets, junction boxes, pull boxes, and other similar equipment identifying the serving equipment and feeder or branch circuit from which the conductors originate.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 DESIGN / PERFORMANCE REQUIREMENTS

A. WattStopper Digital Lighting Management (DLM) shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.

B. Approved Manufacturers for Interior Lighting Controls:

1. Wattstopper

2. Hubbell Building Automation (basis of design)

3. nLight

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. This specification red mark where the system does not comply. Any areas not red marked, it is assumed the system meets this specification. In the event it is found that the system does not meet this specification and this specification is not red marked, the specified system will be purchased and installed by the electrical contractor at no additional cost to the project.

2. Catalog sheets and specifications.

3. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

4. Storage and handling requirements and recommendations.

5. Installation instructions.

B. Shop Drawings: Wiring diagrams a for the various components of the System specified including:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.

2. Show location of all devices, including at minimum sensors, load controllers, switches/dimmers for each area on reflected ceiling plans, and in-room bus connections.

3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.

4. Network riser diagram including floor and building level details. Include network cable specification. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

D. Closeout Submittals:

1. Project Record Documents: Record actual installed locations and settings for lighting control devices.

2. Operation and Maintenance Manual:

a. Include approved Shop Drawings and Product Data.

b. Include Sequence of Operation, identifying operation for each room or space.

c. Include manufacturer's maintenance information.

d. Operation and Maintenance Data: Include detailed information on device programming and setup.

e. Include startup and test reports.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing of centralized and distributed lighting control systems with a minimum of 10 years documented experience.

B. System Components: Demonstrate that individual components have undergone quality control and testing prior to shipping.

1.4 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section. Meeting to be attended by Contractor, system installer, factory authorized manufacturer's representative, and representative of all trades related to the system installation.

B. Review installation procedures and coordination required with related Work and the following:

1. Confirm the location and mounting of all devices, with special attention to placement of switches, dimmers, and any sensors.

2. Review the specifications for low voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

4. Discuss requirements for integration with other trades

C. Inspect and make notes of job conditions prior to installation:

1. Record minutes of the conference and provide copies to all parties present and the specifier.

2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.

3. Installation shall not begin until all outstanding issues are resolved to the satisfaction of the specifier.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 32 to 104 degrees F (0 to 40 degrees C).

2. Relative humidity: Maximum 90 percent, non-condensing.

1.7 WARRANTY

A. Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

PART 2 PRODUCTS

2.1 INTERIOR DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

A. Provide a complete system with all necessary enclosures, wiring, and system components to ensure a complete and properly functioning system as indicated on the Drawings and specified herein. If a conflict is identified, between the Drawing and this Specification, contact the specifier for clarification prior to proceeding.

B. Provide a lighting control system with the following features:

1. Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.

2. Room Controllers: Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase MLV, ELV, or LED control dimming outputs and integral current monitoring capabilities. Controllers include a manual override / dimming button for each channel on the controller. Polarity of each load output is reversible, via digital configuration, so that on is off and off is on. The Class 1 and Class 2 0-10 volt output automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. When room controllers are daisy chained the available power to operate devices is cumulative, so all in room devices can be daisy be chained and powered from a single room controller port. Single dimming controller can support up to 48 communicating devices; single switching room controller can support up to 24 communicating devices.

3. Occupancy Sensors: Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display, two-way active infrared (IR) communications, local PC interface, or network front end. Ceiling sensors offer two built-in RJ45 ports. Digital calibration and pushbutton configuration for the following variables:

    a. Sensitivity, 0-100 percent in 10 percent increments

    b. Time delay, 1-30 minutes in 1 minute increments

    c. Detection technology, PIR, Ultrasonic or Dual Technology activation and/or re-activation.

4. Switches: Single gang self-configuring pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall or reprogramming. Load and Scene button function may be reconfigured in the field for individual buttons from Load to Scene, and vice versa

5. Daylighting Sensors: Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications for daylight harvesting using switching, bi-level, tri-level or dimming control.

    a. Single-zone closed loop automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads

    b. Multi-zone open loop photocell automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.

6. (Optional) Configuration Tools: Able to read and modify parameters for load controllers and relay panels, occupancy sensors, wall switches, daylighting sensors, network bridges, and identify devices by type and serial number. Handheld remote for room configuration and relay panel programming provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.

7. (Required with Line Item 8) Building segment network: Linear topology, BACnet MS/TP network to connect multiple local networks for centralized control.

8. (Optional) Segment Manager: BACnet MS/TP-based controller with web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting. Automatic discovery of devices and relay panels on the segment networks in a standard navigation tree format. Allow information for all devices to be imported into the Segment Manager via a single XML based site file. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control. Any of above items shall be capable of being moved into an "Export Table" that will provide any integrator with only the data they need, and by using the Export Table effectively create a firewall between the integrator's request for info and the overall system performance. Any device on the building network can be remotely accessed through a cellular VPN to verify system is ready for start-up, aid in remote trouble troubleshooting, and device programming for the first year. The VPN is isolated from the building network.

9. Programming and Configuration Software: Free PC-native application capable of accessing and saving control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.

10. (Optional) Digital Zone Controller: Connect up to 64 room controllers. Zone Controller accepts program changes from Two-way infrared (IR) handheld remote or USB programming adapter tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).

11. (Optional) Network Bridge: Provides communication between local room networks, relay panels, segment manager, or BAS via BACNet MS/TP.

2.2 BACnet INFORMATION BY DEVICE

A. Digital Room Controllers:

1. BACnet object information shall be available for the following objects:

a. Load status

b. Schedule state, normal or after-hours

c. Demand Response enable and disable

d. Room occupancy status

e. Total room lighting and plug loads watts

f. Electrical current

g. Total watts per controller

h. Total room watts/sq ft.

i. Force on/off all loads

B. Digital Sensors:

1. BACnet object information shall be available for the following objects:

a. Detection state

b. Occupancy sensor time delay

c. Occupancy sensor sensitivity, PIR and Ultrasonic

C. Digital Wall Switches:

1. BACnet object information shall be available for the following objects:

a. Button state

b. Switch lock control

Switch lock status

D. Digital Photocells:

1. BACnet object information shall be available for the following objects:

a. Light level

b. Day and night setpoints

c. Off time delay

d. On and off setpoints

e. Up to three zone setpoints

f. Operating mode - on/off, bi-level, tri-level or dimming

E. Network Bridge:

1. BACnet object information shall be available for the following objects:

a. Read/write the normal or after hours schedule state for the room

b. Read the detection state of each occupancy sensor

c. Read the aggregate occupancy state of the room

d. Read/write the On/Off state of loads

e. Read/write the dimmed light level of loads

f. Read the button states of switches

g. Read total current in amps, and total power in watts through the load controller

h. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings

i. Activate a preset scene for the room

j. Read/write daylight sensor fade time and day and night setpoints

k. Read the current light level, in foot-candles, from interior and exterior photosensors and photocells

l. Set daylight sensor operating mode

m. Read/write wall switch lock status

n. Read watts per square foot for the entire controlled room

o. Write maximum light level per load for demand response mode

p. Read/write activation of demand response mode for the room

q. Activate/restore demand response mode for the room

2.3 PREPARATION

A. Do not begin installation until measurements have been verified and work areas have been properly prepared.

B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that required pre-installation meeting specified in Part 1 of this specification has been completed, recorded meeting minutes have been distributed and all outstanding issues noted have been resolved prior to the start of installation.

2.4 INSTALLATION

A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.

B. Install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. In room wire substitution is not permitted

1. Install all room to room network devices using manufacturer-supplied LM-MSTP network wire. Network wire substitution is not permitted and may result in loss of product warranty.

2. Low voltage wiring topology must comply with manufacturer's specifications.

3. Route network wiring as indicated on the Drawings as closely as possible. Document final wiring location, routing and topology on as built drawings.

C. All line voltage connections shall be tagged to indicate circuit and switched legs.

D. Test all devices to ensure proper communication.

E. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.

F. Provide written or computer-generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.

2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

3. Load Parameters (e.g. blink warning, etc.)

G. Post start-up tuning – Areas connected to a segment manager, adjust lighting control devices for the owner at no additional charge for the first year.

H. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.

I. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.

J. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.

2.5 START-UP:

A. Manufacturer's Field Service: Engage a factory-authorized service representative to have a preconstruction meeting, midway construction meeting and final meeting inspection.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to have components, assemblies, and equipment installations, including connections, and to assist in testing. Notify Architect and Manufacturer in writing a minimum of 3 weeks prior to system start-up and testing.

C. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.

1. Verify Class I and II wiring connections are terminated properly by validating system performance.

2. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.

3. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.

4. Verify that the control of each space complies with the Sequence of Operation.

5. Correct any system issues and retest..

2.6 DEMONSTRATION AND TRAINING

A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to

designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:

1. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

2.7 PRODUCT SUPPORT AND SERVICE

A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

1. Edit panelboards below to suit Project.
2. Lighting and appliance branch-circuit panelboards.
3. Distribution panelboards.

B. Related Sections include the following:

1. List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.
2. Retain subparagraph below if Project includes fusible panelboards.
3. Section "Fuses."

1.3 DEFINITIONS

A. Retain abbreviations that remain after this Section has been edited.

B. EMI: Electromagnetic interference.

C. GFCI: Ground-fault circuit interrupter.

D. RFI: Radio-frequency interference.

E. RMS: Root mean square.

F. SPDT: Single pole, double throw.

G. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

   a. Enclosure types and details for types other than NEMA 250, Type 1.

   b. Bus configuration, current, and voltage ratings.

   c. Short-circuit current rating of panelboards and overcurrent protective devices.

   d. Delete subparagraph below if series rating of overcurrent protective devices is not used.

   e. UL listing for series rating of installed devices.

   f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Delete paragraph below if independent testing agency is not used.

D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

E. Field Test Reports: Submit written test reports and include the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

G. Maintenance Data: For panelboards and components to include in maintenance manuals specified in other sections. In addition to requirements specified in Section "Contract Closeout," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Retain paragraph and subparagraph below if Contractor or manufacturer selects testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Edit below to delete or add types of equipment that affect panelboard installation.

B. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Extra materials may not be allowed for publicly funded projects. Revise quantity below to suit Project.

B. Keys: [SIX] 6 spares of each type of panelboard cabinet lock.

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:

B. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lists below are examples only. Retain or insert only those manufacturers whose products correspond with other requirements and whose availability and suitability for the application have been verified.

2. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton

b. Square D Co.

c. General Electric

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

1. Delete items below if not applicable. Add other Project-specific requirements.

2. Outdoor Locations: NEMA 250, Type 3R.

3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

4. Enclosures in hazardous locations must be carefully selected to meet the division and group listing of the environment.

5. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Retain paragraph above or below.

D. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

E. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

F. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

G. Bus: Hard-drawn copper, 98 percent conductivity.

H. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.

I. Ten paragraphs below are special features. Add other required features and coordinate with Drawings.

J. Equipment Ground Bus: Copper and adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

K. Delete paragraph below except for panelboards incorporating one or more main service disconnect switches. Edit to suit Project.

L. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

M. Delete paragraph below if future provisions are not required.

N. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.

O. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

P. Split Bus: Vertical buses divided into individual vertical sections.

Q. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

R. Gutter Barrier: Arrange to isolate individual panel sections.

S. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

T. Feed-through Lugs: Copper mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Select one of two paragraphs below for series-rated system or system that has panelboards and circuit breakers rated for full value of short-circuit current available at location of equipment. Edit to suit Project and coordinate with Drawings.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Plug-in or bolt on circuit breakers, replaceable without disturbing adjacent units.

B. Coordinate below with Drawings.

C. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Edit three paragraphs and associated subparagraphs below to suit Project. Coordinate with Drawings.

B. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

C. Main Overcurrent Protective Devices: Circuit breaker.

D. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in or Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Edit three paragraphs and associated subparagraphs below to suit Project. Coordinate with schedules and Drawings.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments.

d. Ground-fault pickup level, time delay, and I^2t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

5. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Revise paragraph below if "Balancing Loads" Paragraph is deleted from "Field Quality Control" Article below.

E. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

F. Install filler plates in unused spaces.

G. Revise below if "Balancing Loads" Paragraph is deleted from "Field Quality Control" Article below.

H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Select Division 16 Section "Basic Electrical Materials and Methods" for projects with simple requirements and Division 16 Section "Electrical Identification" for projects with complex requirements.

B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Basic Electrical Materials and Methods] [Electrical Identification."

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Coordinate paragraphs below with Drawings.

B. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. Retain abbreviations that remain after this Section has been edited for Project.

B. GFI: Ground-fault circuit interrupter.

C. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates.

C. Include sample review below if products may have critical features needing hands-on appraisal.

D. Samples: For devices and device plates for color selection and evaluation of technical features.

E. Maintenance Data: For materials and products to include in maintenance manuals specified in other sections.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Delete paragraph below unless receptacles for Owner-Furnished equipment with plugs have unknown configurations.

B. Receptacles for Owner-Furnished Equipment: Match plug configurations.

C. Coordinate with pool contractor for special receptacles.

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc.

b. Eagle Electric Manufacturing Co., Inc.

c. GE Company; GE Wiring Devices.

d. Hubbell, Inc.; Wiring Devices Div.

e. Killark Electric Manufacturing Co.

f. Pyle-National, Inc.; an Amphenol Co.

2.2 RECEPTACLES

A. Select one of three paragraphs below to specify grade of receptacles. See Editing Instruction No. 3 in the Evaluations for wiring device grades.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.

C. Special Receptacles for NEMA configuration refer to Manufacturer specs.

D. Termination-type GFCI unit may be substituted for feed-through type where no protection of downstream receptacles is required.

E. GFI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Device shall have an indicator light.

F. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap. Device shall be white finish with the orange symbol.

2. Devices: Listed and labeled as Isolated-ground receptacles.

3. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

A. General

1. Switches shall be toggle rocker type as indicated herein.. The body of the switch shall be made of an arc-resistant thermoset material. All toggle switch handles shall be constructed of a thermoplastic material. All rocker switch handles shall be constructed of a thermoset material. All wall switches shall be of the quiet AC type.

2. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.

3. Switch color shall be white unless noted otherwise. Coordinate with Architect.

B. Specification Grade

1. Specification Grade switches shall be toggle type. The contact arms shall be made of one-piece copper alloy material. The switch shall include a green ground screw attached to the mounting strap. The switch shall be 20-ampere, 120/277-volts AC, horsepower rated, back and side-wired.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Modify subparagraph below to suit preference.

2. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.

3. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide with “on/off” switch; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch (130-mm) wire connecting leads. Dimmer to be sized per circuit load.

2.4 WALL PLATES(All wall plates)

A. For all single and combination types match corresponding wiring devices.

4. Plate-Securing Screws: Metal with head color to match plate finish.

5. Select one of five subparagraphs below. Coordinate with Division 9 Section "Painting."

6. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.

7. Select one of three subparagraphs below or delete all.

8. Material for Unfinished Spaces: stainless steel.

2.5 FLOOR SERVICE FITTINGS

A. Items in this Article are available for telephone and data cable service as well as power. Edit to suit Project.

B. Select one of three paragraphs below.

C. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

D. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Coordinate two paragraphs below with Drawings.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

G. Protect devices and assemblies during painting.

H. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section "Electrical Identification."

B. Select paragraph above or below.

C. Comply with Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Select paragraph above or below. Coordinate with Division 16 Section "Grounding."

B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

C. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

D. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Dparagraph below if GFCIs are not in Part 2.

C. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

D. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fuses.

1.3 SUBMITTALS

A. Use this Article to convey basic design intent. Delete if Drawings show sufficient detail to clarify intent.

B. General: Submit each item in this Article according to the Conditions of the Contract and Specification Sections.

C. Product Data for each fuse type specified.

D. Select above or below. Data listed in paragraph below are appropriate where selective coordination is necessary.

E. Field test reports indicating and interpreting test results.

F. Maintenance data for tripping devices to include in the operation and maintenance manual specified in other sections.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Subparagraph below is required by some Federal agencies.

3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

A. Extra materials may not be allowed for publicly funded projects.

B. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:

B. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."

C. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

1. See Editing Instruction No. 1 in the Evaluations for cautions about naming products and manufacturers.

2. Cooper Industries, Inc.; Bussmann Div.

3. Eagle Electric Mfg. Co., Inc.

4. Ferraz Corp.

5. General Electric Co.; Wiring Devices Div.

6. Gould Shawmut.

7. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.

1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.

2. Finish: Gray, baked enamel.

3. Identification: Stencil legend "SPARE FUSES" in 1-1/2-inch (40-mm) letters on door.

4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Select and edit paragraphs below. Add paragraphs as Project requires to specify fuse applications rather than show them on Drawings.

B. Motor Branch Circuits: Class RK1, time delay.

C. Other Branch Circuits: Class RK5, non-time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

B. Install spare fuse cabinet where indicated.

3.4 IDENTIFICATION

A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION

SECTION 26 28 16.16
ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of disconnect switches, including all related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with other Sections for products specified under PART 2 - PRODUCTS.

B. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.

C. Provide designations for each disconnect. RE: to section 16075.

1.4 REFERENCE STANDARDS

A. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - Enclosed and Dead Front Switches
2. NEMA KS1 - Enclosed Switches
3. NEMA 250 - Enclosures for Electrical Equipment

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Eaton

B. Square D Co.

C. General Electric

2.2 GENERAL

A. Switches shall be heavy duty type.

2.3 SWITCH INTERIOR

A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open.

D. Lugs shall be copper and front removable and UL listed for 60°C or 75°C conductors 30-100 ampere, 75°C conductors 200 ampere and up.

E. Current carrying parts shall be plated to resist corrosion.

F. Switches shall have removable arc suppressor to facilitate easy access to line side lugs.

G. Switches shall have provisions for a field installable electrical interlock.

2.4 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

B. The operating handle shall be an integral part of the box, not the cover.

C. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

D. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and indicate handle position.

E. Switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.5 SWITCH ENCLOSURES

A. Switch covers shall be attached with welded pin-type hinges (Type 1) or top-hinged, attached with removable screws and securable in the open position (Type 3R).

B. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1) or gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

C. The enclosure shall have ON and OFF markings stamped into the cover.

D. The operating handle shall be provided with a dual colored, red/black position indication.

E. Switches shall have provisions to accept up to three 3/8" hasp padlocks to lock the operating handle in the OFF position.

H. Tangential knockouts shall be provided to facilitate ease of conduit entry (Type 1).

I. Type 3R enclosure shall contain no knockouts. Supply watertight hubs.

J. Type 4x shall be stainless steel enclosure with no knockouts. Supply watertight hubs.

2.6 SWITCH RATINGS

A. Switches shall be horsepower rated.

B. The UL listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere employing appropriate fuse rejection schemes.

PART 3- EXECUTION

3.1 INSTALLATION

D. Install disconnect switches where indicated shown or not shown.

E. Install fuses in fusible disconnect switches.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, emergency lighting units, and accessories.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.

2. Select one of two subparagraphs below. With second subparagraph, photometric tests by manufacturer's laboratory are acceptable.

3. Certified results of laboratory tests for fixtures and lamps for photometric performance.

4. Emergency lighting unit battery and charger.

5. LED lights

6. Retain two subparagraphs below for projects with air-handling fixtures.

7. Types of lamps.

B. Delete paragraph and subparagraph below unless custom fixtures are indicated.

C. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.

1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

D. Consider retaining paragraph below for projects with congested ceiling space and where Drawings do not include comprehensive reflected ceiling plans.

E. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.

F. Retain paragraph and subparagraphs below if fixture Samples are required for verification purposes. Edit if sample requirements are indicated in other than interior lighting fixture schedule. As an alternative, list of fixture types for sample submission can be added below.

G. Delete paragraph below if not required.

H. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

I. Delete paragraph below except for projects with extensive tests of emergency lighting equipment.

J. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

K. Maintenance Data: For lighting fixtures to include in maintenance manuals in the close out documents.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. Delete paragraph below if FM compliance is not required. Coordinate with Drawings.

D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Retain this Article if Coordination Drawings are not required.

B. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Interior Lighting Fixture Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

2.3 LED FIXTURES

A. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Include the following features unless otherwise indicated:

1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).

2. Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a minimum ambient temperature of (25°C).

3. Light Emitting Diodes tested under LM-80 Standards for a minimum of 12,000 hours.

4. Color Rendering Index (CRI) of 82 at a minimum.

5. Color temperature [3500] <Insert value> K, unless otherwise indicated.

6. Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.

7. Fixture efficacy of 60 Lumens/Watt, minimum.

8. 5 year luminaire warranty, minimum.

9. Photometry must comply with IESNA LM-79.

10. The individual LEDs shall be constructed such that a catastrophic loss of the failure of one LED will not result in the loss of the entire luminaire.

11. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.

C. Technical Requirements

1. Luminaire shall have a minimum efficacy of 60 lumens per watt. The luminaire shall not consume power in the off state.

2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.

3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.

4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 15 percent.

5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

D. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

2. The LED manufacturer’s maximum thermal pad temperature for the expected life shall not be exceeded.

3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

4. The luminaire shall have a minimum heat sink surface such that LED manufacturer’s maximum junction temperature is not exceeded at maximum rated ambient temperature.

2.4 LED EXIT SIGNS

A. Exit light fixtures shall meet applicable requirements of NFPA and UL.

B. Housing and door shall be die-cast aluminum.

C. For general purpose exit light fixtures, door frame shall be hinged, with latch. For vandal-resistant exit light fixtures, door frame shall be secured with tamper-resistant screws.

D. Finish shall be satin or fine-grain brushed aluminum.

E. There shall be no radioactive material used in the fixtures.

F. Fixtures:

1. Inscription panels shall be cast or stamped aluminum a minimum of 2.25 mm (0.090 inch) thick, stenciled with 150 mm (6 inch) high letters, baked with red color stable plastic or fiberglass. Lamps shall be luminous Light Emitting Diodes (LED) mounted in center of letters on red color stable plastic or fiberglass.

2. Double-Faced Fixtures: Provide double-faced fixtures where required or as shown on drawings.

3. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.

G. Voltage: Multi-voltage (120 – 277V).

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and special warranty.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 LAMPS

A. ALL LED – NO LAMPS

2.7 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. NFPA 70 requires minimum support for fixtures. Retain paragraphs below for more specific support requirements and for requirements exceeding code minimums. Units in seismic zones must have additional supports and restraining devices beyond those specified here. See Editing Instruction No. 3 in the Evaluations.

C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Do not use grid for support.

1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.

2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.

3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

D. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.

2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.

3. Verify normal transfer to battery source and retransfer to normal.

4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 27 05 33
CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions apply to work covered by this Section.

B. Comply with Sections 26 00 00, as applicable. Refer to other Sections for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a telephone and data communications empty conduit system, including all related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with the Architectural sections.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conduit, conduit sleeves, outlet boxes, cover plates and pullwire as indicated.

B. Fireproofing material for telephone and data communication conduit and conduit sleeves through fire rated walls and floors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install telephone and data communication raceways as indicated.

B. Install individual raceways from telephone and data communications outlets to above accessible ceiling. In areas without a ceiling, raceways shall be routed to the nearest ceiling space. In building without a ceiling, raceways shall be extended back to the main telephone/ data communication board or to a location indicated on the Drawings.

1 Minimum size conduit: 1.25", REFER TO PLANS FOR SIZES.

2 Raceway installation shall be in accordance with Section 26 05 33.

3 Coordinate raceway installations in millwork and other fabricated architectural items with the other portions of the Work.

4 Provide pullwire in each raceway tagged on each end.

5 Raceways shall be terminated with an insulating bushing or a suitable connector with an

insulated throat.

C. Provide telephone and data communications outlet boxes.

6 Provide a one-gang outlet unless noted otherwise.

7 Install outlet box and device ring at each location.

8 Install telephone and data communications outlets at same height specified for convenience outlets unless noted otherwise. Group telephone and data communications outlets with related receptacle outlets unless noted otherwise.

9 Install a blank cover plate on all unused communications outlet boxes.

END OF SECTION

28 46 21.11
ADDRESSABLE FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification Sections apply to Work covered by this Section.

B. Comply with applicable sections in division 26. Refer to other Sections for coordination of the Work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing additional and new devices for new building.

1. Fire alarm control panel
2. Remote Annunciator
3. Addressable or conventional manual fire alarm stations.
4. Addressable analog and conventional area smoke detectors.
5. Conventional beam detectors.
6. Addressable analog and conventional duct smoke detectors.
7. Addressable analog and conventional heat detectors.
8. Sprinkler water flow alarm switches.
9. Audible notification appliances; bells, horns, chimes.
10. Visual notification appliances; strobes.
11. Central station alarm connection control.
12. Air handling systems shutdown control.
13. Magnetic door holder release.
14. Dry pipe sprinkler release valve/deluge valve control.
15. Sprinkler supervisory switches and tamper switch supervision.
16. Dry pipe sprinkler release valve/deluge valve supervision.
17. Battery standby.
18. System shall activate the overhead gates. Provide all accessories for an active system.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with other Sections for products specified under PART 2 - PRODUCTS. Shop drawings shall be generated by the Fire Alarm Contractor without the Engineers plans.

B. The submittal data shall include, but not necessarily be limited to, the following:

1. Complete bill of material indicating quantity, part numbers and brief description.

2. Data sheets for all products. If multiple models are shown on the same data sheet, highlight the specific model used.

3. Provide drawing with all devices.

1.4 REFERENCE STANDARDS

A. The fire alarm system devices specified herein shall be designed, manufactured, installed and tested according to the latest version of the following standards:

1 National Fire Protection Association Standards

1. NFPA 70 - National Electric Code (NEC), Articles 725 & 760.

2. NFPA 71 - Central Station Signaling Systems

3. NFPA 72 - National Fire Alarm Code (NFAC)

4. NFPA 92A - Smoke Control Systems

5. NFPA 101 - Life Safety Code

6. Underwriters Laboratories, Inc.

7. UL 38 - Manually Activated Signaling Boxes

8. UL 228 - Door Holders for Fire Protective Signaling Systems

9. UL 268 - Smoke Detectors for Fire Protective Signaling Systems

10. UL268A - Smoke Detectors for Duct Applications

11. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems

12. UL 464 - Audible Signaling Appliances

13. UL 864/UOJZ/APOU - Control Units for Fire Protective Signaling Systems

14. UL 1481 - Power Supplies for Fire Protective Signaling Systems

15. UL 1638 - Visual Signaling Appliances

16. UL 1711 - Amplifiers for Fire Protective Signaling Systems

17. UL 1971 - Standard for Fire Protective Signaling Systems

18. Americans with Disabilities Act (ADA)

19. Local and State Building Codes

20. Local Authorities Having Jurisdiction (LAHJ)

1.5 QUALITY ASSURANCE

A. The fire alarm system devices shall be listed and labeled by Underwriters Laboratories, Inc. for use in fire protective signaling system.

B. The Installing Contractor shall be factory authorized and trained and shall be NICET certified in the sub-field of Fire Alarm Systems, for the engineering and technical installation and supervision of the system. This certification shall be Level III for engineering and Level II for technical installation and supervision. Proof of certification shall be provided. All work shall be performed by skilled technicians, under the supervision and direction of the designated NICET engineering technician, all of whom shall be properly trained and qualified for the work.

C. The fire alarm contractor shall not sub out portion of the work. The fire alarm shall be responsible to complete the job.

D. Submission to Authority Having Jurisdiction: Submit copies of State Certificate as required by State Fire Marshall. Provide copy with operating and maintenance manual.

1.6 QUALIFICATIONS

1. The fire alarm contractor, as a business entity, shall be an authorized and designated representative of the equipment manufacturer and shall have been actively engaged in the business of selling, installation and servicing fire alarm systems for a period of at least (5) years prior to the bid date.

2. The fire alarm contractor shall have an office within the Rio Grande Valley with trained technicians who are qualified to manage the installation, to be responsible that the system is installed as submitted, to conduct system start-up, to instruct the project coordinators representatives and local authorities in the proper operation of the system, and to provide service throughout the warranty period. 3. The fire alarm contractor SHALL NOT HAVE any grievances or complaints on record regarding workmanship, code compliance, or service response with either the project coordinator, Architect, Engineer, Owner or the State Fire Marshals office. A contractor that has any prior finding(s) of a Fire Alarm license violation or has any litigation in process with the State Fire Marshal is unacceptable.

3. The fire alarm contractor shall be an active installer on the approved manufacturer for a minimum of 5 years.

1.7 WARRANTY

1. Warranty of all control equipment, sensors, I/O modules and all other peripherals and of materials, installation and workmanship shall be for one (1) year from date of acceptance.

2. The Contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Existing Notifier, new fire alarm devices shall be of the same manufacturer.

2.2 CIRCUITING GUIDELINES

B. Each addressable analog loop shall be circuited as shown on the drawings but device loading in not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class A operation. When it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class A zone wiring. The audio system components shall be an integral part of the fire alarm system control panel.

C. Audio Amplifiers

1. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any digitized audio channels. The channel selection shall be directed by the system software. Multiple and different audio signals shall be able to be broadcast simultaneously from the same system network node.

2. Each amplifier output shall include a dedicated, supervised speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit for connection of visual (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.

3. Standby audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.

4. In the event of a total loss of audio data communications, all amplifiers will default to the local “EVAC” tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.

5. In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone.

6. Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

2.3 DETECTORS

D. General

1. Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters.

2. Detectors shall have an integral microprocessor capable of making alarm decisions based on

fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total loop response time for detectors shall be 0.5 seconds.

3. Detectors shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.

4. Detectors shall be capable of identifying diagnostic codes to be used for system maintenance. The diagnostic codes shall be stored at the detector.

5. Detectors shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each detector shall be individually programmable to operate at various sensibility settings.

6. The detector microprocessor shall contain an environmental compensation algorithm which identifies and sets ambient "environmental thresholds." The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both long term and short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be permanently stored at the detector.

7. The detector and loop controller shall provide increased reliability and inherent survivability through intelligent conventional operation. The device shall automatically change to stand alone, conventional device operation in the event of a loop controller polling communications failure. In the standalone detector mode, the detector shall continue to operate using sensitivity and environmental compensation information, stored in its microprocessor at the time of communications failure. The loop controller shall monitor the loop and activate a loop alarm if a detector reaches its alarm sensitivity threshold.

8. Detectors shall be capable of automatic electronic addressing and/or custom addressing. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.

9. Detectors shall be suitable for operation in the following environment:

    1. Temperature: 32ºF to 120ºF

    2. Humidity: 0-93% RH, non-condensing

    3. Elevation: Up to 6,000 ft.

10. Photoelectric Smoke Detectors

ii. Addressable intelligent photoelectric smoke detectors shall be provided as indicated on the Drawings. The detector shall use a light scattering type photo electric smoke sensor to

sense changes in air samples from its surroundings. An integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The detector shall utilize digital filters to remove signal patterns that are not typical of fires. Each detector shall have twin red/green status LEDs. The red LED shall indicate alarm condition and green LED shall indicate normal.

iii. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature and humidity. The information shall be stored in the integral processor and transferred to the loop controller.

iv. Detector shall be programmable for different sensitivity during day and night periods.

v. The detector shall be suitable for direct insertion into air ducts up to 3 ft. high and 3 ft. wide with air velocities up to 5,000 ft/min.

vi. The detector shall be rated for ceiling installation at a minimum of 30 foot centers.

vii. The percent smoke obscuration per foot alarm setpoint for the detector shall be field selectable to various sensitive settings ranging from 1.0% to 3.5%.

b. Detector Mounting Bases

i. Detector mounting bases shall be suitable for mounting on a standard 4" square electrical outlet box. The base shall contain no electronics, support all detector types and have the following minimum requirements:

1. Removal of the respective detector shall not affect communications with other detectors.

2. Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.

3. Capable of supporting a remote LED indicator and test station. Provide remote LED indicators and test stations as indicated on the Drawings.

c. Detector Mounting Plates

i. Provide detector mounting plate assemblies to facilitate mounting detectors for direct insertion into low velocity ductwork. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish.

d. Duct Smoke Detectors

i. Air duct mounted smoke detectors shall be provided in the air supply stream of all central air handling equipment above 2000 cfm, i.e. Provide all necessary interface wiring for proper system operation.

ii. The duct smoke detector shall be UL listed per UL 268A specifically for use in air handling systems. The detector shall operate at velocities of 300-4000 ft./min. The detector housing shall be equipped with an integral mounting base. It shall be capable of local testing via magnetic switch or remote testing using a remote test station. The duct detector housing shall incorporate an airtight smoke chamber in compliance with UL 268A. The housing shall be capable of mounting to either rectangular or round ducts without adaptor brackets. An integral filter system shall be included to reduce dust and residue effects on

detector housing, thereby reducing maintenance and servicing. Sampling tubes shall be easily installed after the housing is mounted to the duct by passing through the duct housing. The housing shall have a red enamel finish.

iii. For each duct smoke detector provide a remote LED indicator and test station to be mounted in a location indicated on the Drawings and approved by the local authority having jurisdiction.

iv. F. Beam Type Smoke Detectors 1. Provide projected beam type smoke detectors. Then beam detectors shall be four wire 24 Vdc and powered from the control panel 4 wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 ft. (9.14 to 30.4m) or a long range of 100 to 300 ft. (30.4 to 91.4m). The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or mount as shown on the plans. Testing shall be carried out using calibrated test filters. Provide an activated remote test station>.

b) SYSTEM MODULES

a. Addressable intelligent modules shall support supervised Class A circuits. The modules shall be multi-function capable of field programming. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

i. Temperature: 32°F to 120°F (0°C to 49°C)

ii. Humidity: 0-93% RH, non-condensing

b. Single Input Module

i. Addressable intelligent single input modules shall be provided as required for the system configuration. The single input module shall provide one (1) supervised Class A input circuit. The module shall be suitable for mounting on 4” square electrical box. The single input module shall support the following input circuit types:

1. Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

2. Normally-Open Alarm Delayed Latching (Waterflow Switches)

3. Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

4. Normally-Open Active Latching (Supervisory, Tamper Switches)

c. Dual Input Module

1. Addressable intelligent dual input modules shall be provided as required for the system configuration. The dual input module shall provide two (2) supervisedCLASS

A input circuits. The module shall be suitable for mounting on a standard 4” square electrical box. The dual input module shall support the following input circuit types:

2. Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

3. Normally-Open Alarm Delayed Latching (Waterflow Switches)

4. Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

5. Normally-Open Active Latching (Supervisory, Tamper Switches)

d. Monitor Module

1. Addressable intelligent monitor modules shall be provided as required for the system configuration. The monitor module shall support one (1) supervised Class A normally-open active non-latching monitor circuit. The monitor module shall be suitable for mounting on a standard 4” square electrical box.

e. Waterflow/Tamper Module

1. Addressable intelligent waterflow/tamper modules shall be provided as required for the system configuration. The waterflow/tamper module shall support two (2) supervised Class A input circuits. Channel A shall support a normally-open alarm delayed latching waterflow switch circuit. Channel B shall support a normally-open active latching tamper switch. The waterflow/tamper module shall be suitable for mounting on a standard 4” square electrical box.

f. Single Input Signal Module

1. Addressable intelligent single input signal modules shall be provided as required for the system configuration. The single input signal module shall provide one (1) supervised Class A output circuit capable of supporting the operation of an audible/ visual signal power selector and a telephone power selector with ring tone for fire fighter’s telephone. The module shall be suitable for mounting on a standard 4” square electrical box.

g. Dual Input Signal Module

1. Addressable intelligent dual input signal modules shall be provided as required for the system configuration. The dual input signal module shall provide a means to selectively connect one of two (2) signaling circuits to one (1) supervised output circuit. The dual input signal modules shall be capable of supporting the operation of an audible/visual signal power selector. The module shall be suitable for mounting on a standard 4” square electrical box.

h. Control Relay Module

1. Addressable intelligent control relay modules shall be provided as required for the system configuration. The control relay module shall provide one form “C” dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on a standard 4" square electrical box.

i. Universal Class A Module

i.Addressable intelligent class A modules shall be provided as required for the system configuration. The universal class A module shall be capable of numerous operations. The module shall be suitable for mounting on a standard 4” square electrical box. The universal class A module shall support the following circuit types:

1. Two (2) supervised Class A Normally-Open Alarm Latching.
2. Two (2) supervised Class A Normally-Open Alarm Delayed Latching.
3. Two (2) supervised Class A Normally-Open Active Non-Latching.
4. Two (2) supervised Class A Normally-Open Active Latching.
5. One (1) form “C” dry relay contact rated at 2 amps @ 24 Vdc.
6. One (1) supervised Class A Normally-Open Alarm Latching.
7. One (1) supervised Class A Normally-Open Alarm Delayed Latching.
8. One (1) supervised Class A Normally-Open Active Non-Latching.
9. One (1) supervised Class A Normally-Open Active Latching.
10. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
11. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
12. One (1) supervised Class A 2-wire Smoke Alarm Verified
13. One (1) supervised Class A 2-wire Smoke Alarm Verified
14. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
15. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.

c) MANUAL PULL STATIONS

a. Addressable intelligent dual action, non-break glass type, key reset, semi-flush mounted manual pull stations shall be provided as indicated on the Drawings. The stations shall be of Lexan construction, finished in red with white molded raised letters “PULL IN CASE OF FIRE”. The station shall be suitable for mounting on a standard 4" square electrical box. The station shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

i.Temperature: 32^{o}F to 120^{o}F (0^{o}C to 49^{o}C)

ii.Humidity: 0-93% RH, non-condensing

d) NOTIFICATION APPLIANCES

a. General

i. All appliances shall be UL listed for Fire Protective Service. All audible appliances, visual appliances and combination audible/visual appliances shall be capable of providing the equivalent facilitation which is allowed under the Americans with Disabilities Act Accesabilities Guidelines (ADA/AG), and shall be UL 1971, and ULC S526 listed.

b. Audible Only Notification Appliances

i. Audible appliances shall be a mylar cone type speaker. Paper type cones are not acceptable. The rear of the speaker shall be completely sealed protecting the cone during and after installation. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide UL confirmed 90 dBA sound output at 2w.

ii. Audible appliances shall be provided with in/out wiring terminals.

iii. Audible appliances shall be flush for ceiling mounted and flush/semi-flush for wall mounted as indicated on the Drawings. They shall have a white faceplate for ceiling mounting and red faceplate for wall mounting. They shall mount to a standard 4" square electrical box.

c. Visual Only Notification Appliances

i. Visual appliances shall be a self-synchronized strobe. The strobe flashtube shall be enclosed in a rugged lexan lens with solid state circuitry. The strobe shall provide 15, 15/75, 30, 60 and 110 candela synchronized flash outputs. The strobe intensity selection shall be based on the installed location within the building.

ii. Visual appliances shall be provided with in/out field wiring terminals.

iii. Visual appliances shall have lens markings oriented for wall mounting where indicated on the Drawings. They shall have a red faceplate for flush/semi-flush wall mounting. They shall mount to a standard 4" square electrical outlet box.

d. Combination Audible/Visual Notification Appliances

i. Combination appliances shall be a combination of the audible and visual appliances specified previously. They shall have a red faceplate for flush/semi-flush wall mounting.

ii. The majority, if not all, of the notification appliances shall be combination devices such that the visual and audible requirements of ADA shall be complied with. Visual notification appliances shall be located in all areas of common use, i.e. lobbies, hallways, restrooms, meeting/conference/assembly areas, break rooms, copy/fax/mail rooms, etc. Audible notification appliances shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15dbA or exceeds any maximum sound level with a duration of 60 seconds by 5dbA, whichever is louder. Sound levels for alarm signals shall not exceed 120 dbA. It is the intent of the Drawings to show all devices that are required. The fire alarm system vendor/bidder shall provide all appliances shown and/or required by these specifications but it others are anticipated to be required the vendor/bidder shall qualify the provisions for the system making note of the additional cost for the anticipated additional requirements.

e) ANCILLARY DEVICES

a. Remote Relays

i. Multi-Voltage Control Relays

1. Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT or DPDT, as required, and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, 24 Vac, 115 Vac, or 230 Vac, as required. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

ii. Manual Override Control Relays

1. Remote control relays with a manual override shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.

iii. Heavy Duty Power Relays

1. Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of 24 Vac,115 Vac, as required. A metal enclosure shall be provided.

f) ELECTROMAGNETIC DOOR HOLDERS

a. Provide single or double door, floor or wall mounted electromagnetic door holder/release devices as indicated on the Drawings. The devices shall be rated for 24V ac/dc input. The devices shall be brushed zinc finished.

g) FIRE ALARM CABLE

a. The fire alarm cable shall plenum rated and be UL listed and suitable for use as power limited fire protective signaling circuit cable in accordance with National Electric Code Article 760 (Fire Alarm Systems) and Article 725 (Class 1, Class 2 and Class 3 - Remote Control, Signaling and Power-Limited Circuits).

b. Cable Construction

i. Conductors shall be solid, soft annealed, uncoated copper.

ii. Insulation shall be 300 volt, 105ºC polyvinylchloride.

iii. Two conductor, non-shielded cables shall be parallel; shielded and three or more conductors shall be cabled round.

iv. Shielding shall be mylar backed aluminum foil, helically wrapped to provide 100% coverage. A suitable copper drain wire shall be provided with shielded cables.

v. Jacket shall be red, 105ºC polyvinylchloride, rated 300 volt.

vi. Cable shall be plenum rated when installed in air handling plenums.

c. In general, non-shielded cable is acceptable for use throughout except on voice circuits. All voice circuits shall utilize shielded, twisted pair cable.

PART 3 - EXECUTION

3.1 APPROVALS

A. Complete fire alarm system drawings shall be issued to the Local Authority Having Jurisdiction for approval prior to the installation of the fire alarm system.

3.2 INSTALLATION

A. Installation of the Fire Alarm System shall be in strict compliance with manufacturers recommendations. The entire system shall be installed in accordance with approved manufacturers manuals and wiring diagrams and as approved by the Local Authority Having Jurisdiction.

B. Fire alarm cable shall be installed in conduit in areas of exposed structure and within inaccessible ceilings. Conduit shall also be provided from outlet boxes within walls stubbed up to accessible ceilings. Provide end bushings on conduit stub-ups. Cable only is acceptable in accessible ceilings.

C. All conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation shall be included as part of the system. All junction box blank coverplates shall be labeled with a red “F.A.” for identification purposes.

D. All wiring shall be color coded throughout.

E. The system shall be installed and fully tested under the supervision of trained manufacturer's representatives. The system shall be demonstrated to perform all the functions as specified.

END OF SECTION

APPENDIX "A"

TABLE OF CONTENTS

DIVISION 3- CONCRETE

DIVISION 4- MASONRY

DIVISION 5- METALS

DIVISION 31- SITE CONSTRUCTION

END OF SECTION

09-16-19

DIVISION 3 CONCRETE
03 10 00 CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

B. Related Sections:
1. Section 032000 - Concrete Reinforcement.
2. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:
1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:
1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. ASTM International:
1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

E. West Coast Lumber Inspection Bureau:
1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum .03 perms when tested in accordance with ASTM E96, Procedure A.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 ACI 301 ACI 318.

B. For wood products furnished for work of this Section, comply with AF&PA.

C. Perform Work in accordance with State Municipality of Highways Public Work's standard.

1.6 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES

A. Vapor Retarder: Where indicated on Drawings, 10 mil thick polyethylene sheet manufacture by:
   1. Stego Wrap Class A: by Stego Industries LLC (887) 464-7834
   2. Griffolyn by Reef Industries (800) 231-6074
   3. VaporBlock 10 by Raven Industries (800) 635-3456
   4. Perminator Vapor – May by W.R. Meadows (800) 342-5976
   5. Xtreme by Tex-Trude (281) 452-5961
   6. Or Equivalent

B. Bituminous Joint Filler: ASTM D1751.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

D. Water Stops: Rubber Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

****** OR ******

E. Waterstop: Flexible strip of bentonite waterproofing compound in coil form for joints in concrete construction.
   1. Colloid Environmental Technologies Company Model.
   2. TC MiraDRi Model.
   3. Paramount Technical Products Model.
   4. Substitutions: Section 016000 - Product Requirements Not Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:
   1. Earth forms are not permitted.

B. Formwork - General:
   1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
   2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
   3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.

4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 ACI 318.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Obtain Architect/Engineer’s approval before framing openings in structural members not indicated on Drawings.

G. Install fillet and chamfer strips on external corners of beams joists columns and.

H. Install void forms in accordance with manufacturer's recommendations.
1. SureVoid Products, Inc., Englewood, CO (800) 458-5444.

I. Do not reuse wood formwork more than times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.

J. Openings for Items Passing Through Concrete:

1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

K. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

L. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not be permitted.

M. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301 ACI 318.

****** OR ******

B. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301 ACI 318.

3.8 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements 017000 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

DIVISION 03 CONCRETE
03 20 00 CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Sections:
1. Section 031000 - Concrete Forms and Accessories.
2. Section 033000 - Cast-in-Place Concrete.
3. Section 033500 - Concrete: Reinforcement for concrete floor toppings.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530.1 - Specifications for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.

C. American Welding Society:
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
1. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301, and ACI 318.

B. Prepare shop drawings in accordance with ACI SP-66.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Deformed and Plain Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars, unfinished.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic tipped steel; size and shape to meet Project conditions.

D. Reinforcing Splicing Devices: Mechanical type; full tension and compression; sized to fit joined reinforcing.

E. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, and ACI 318, on and all applicable codes.

B. Form standard hooks for 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318 and all applicable codes.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Form spiral column reinforcement from minimum 3/8 inch diameter continuous deformed bar or wire.

F. Form ties and stirrups from the following:
   1. For bars No. 10 and Smaller: No. 3 deformed bars.
   2. For bars No. 11 and Larger: No. 4 deformed bars.

G. Weld reinforcement in accordance with AWS D1.4.

H. Galvanized Epoxy-Coated Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI.

I. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

2.4 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Make completed reinforcement available for inspection at manufacturer’s factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.

C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
1. Do not weld crossing reinforcement bars for assembly.

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch.
1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

E. Maintain concrete cover around reinforcement in accordance with ACI 318 applicable code as follows:

Footings and Concrete Formed Against Earth		3 inches
Concrete exposed to earth or weather	No. 6 bars and larger	2 inches
	No. 5 bars and smaller	1-1/2 inches
Supported Slabs, Walls, and Joists	No. 14 bars and larger	1-1/2 inches
	No. 11 bars and smaller	3/4 inches
Beams and Columns		1-1/2 inches

Shell and Folded Plate Members	No. 6 bars and larger	3/4 inches
	No. 5 bars and smaller	1/2 inches

3.2 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	Depth Tolerance	Concrete Cover Tolerance
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

C. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner’s testing laboratory in accordance with ACI 318 and IBC 2006.

C. Provide free access to Work and cooperate with appointed firm.

D. Reinforcement Inspection:
1. Placement Acceptance: Specified and ACI 318 material requirements and specified placement tolerances.
2. Welding: Inspect welds in accordance with AWS D1.1.
3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability when formed from steel other than ASTM A706/A706M.
5. Continuous Weld Inspection: Inspect reinforcement as required by ACI 318.
6. Periodic Weld Inspection: Other welded connections.

3.4 SCHEDULES

A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade:Deformed bars and wire fabric, galvanized finish.

C. Reinforcement For Parking Structure Framing Members: Deformed bars, epoxy-coated finish.

END OF SECTION

DIVISION 3 CONCRETE
03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Foundation walls.
   2. Supported slabs.
   3. Slabs on grade.
   4. Control, expansion and contraction joint devices.
   5. Equipment pads.
   6. Light pole base.
   7. Flagpole base.

B. Related Sections:
   1. Section 031000 - Concrete Forms and Accessories: Formwork and accessories. Placement of joint device joint device anchors in formwork.
   2. Section 032000 - Concrete Reinforcement.
   3. Section 033500 - Concrete Finishing.
   4. Section 033900 - Concrete Curing.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 305 - Hot Weather Concreting.
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   4. ACI 308.1 - Standard Specification for Curing Concrete.
   5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   3. ASTM C33 - Standard Specification for Concrete Aggregates.
   4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
   8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
31. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum .03 perm when tested in accordance with ASTM E96.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures.

C. Design Data:
1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
a. Hot and cold weather concrete work.
b. Air entrained concrete work.
2. Identify mix ingredients and proportions, including admixtures.

3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 318.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

1.7 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.9 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal

B. Normal Weight Aggregates: ASTM C33.
1. Coarse Aggregate Maximum Size: 1.5

C. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Fly Ash: ASTM C618 type C or F.

C. Silica Fume: ASTM C1240.

2.3 ACCESSORIES

A. Vapor Retarder: ASTM E1745 Class A; 10 mil thick; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

B. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler; Asphalt impregnated fiberboard or felt, tongue and groove profile.

****** OR ******

B. Joint Filler: ASTM D1752; Closed cell, resiliency of 95 percent if not compressed more than 50 percent of original thickness.

C. Sealant: ASTM C309, Type I approved by Asphalt and Vinyl composition Tile Institute, 30% minimum solids content.

2.5 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1

B. Provide concrete for the following criteria:

Material and Property	Measurement
Compressive Strength (7 day)	2100 psi
Compressive Strength (28 day)	3000 psi
Cement Type	ASTM C150
Aggregate Size (maximum)	1.5 inch
Air Content	Do not use air entrainment for concrete mixes.
Slump	5 inches

C. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.
   1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
   2. Do not use calcium chloride nor admixtures containing calcium chloride.
   3. Use set retarding admixtures during hot weather.

D. Site Mixed Concrete: No site mixed concrete is allowed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify testing laboratory and Architect/Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and are not disturbed during concrete placement.

D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by adhesive applied between overlapping edges and ends as per manufacturer recommendations.

E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.

H. Install joint covers in one piece longest practical length, when adjacent construction activity is complete.

I. Deposit concrete at final position. Prevent segregation of mix.

J. Place concrete in continuous operation for each panel or section determined by predetermined joints.

K. Consolidate concrete.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

P. Screed floors and slabs on grade level, maintaining surface flatness of F_f of 35.

3.4 CONCRETE FINISHING

A. Finish concrete floor surfaces to requirements of Section 03350.

B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum 5 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces as specified in Section 03390.

D. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days.

E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner’s testing laboratory in accordance with ACI 318

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.
   2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
   1. Sampling Procedures: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured field cured.
   3. Sample concrete and make one set of three cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
   4. When volume of concrete for any class of concrete would provide less than 3 sets of cylinders, take samples from three randomly selected batches, or from every batch when less than 3 batches are used.
   5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
2. Test Acceptance: In accordance with ACI 318 .
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: ASTM C42/C42M.
2. Test Acceptance: In accordance with ACI 318.
3. Drill three cores for each failed strength test from concrete represented by failed strength test.

J. Water Soluble Chloride Ion Concentration Test Method: ASTM C1218; tested at 28 days.
1. Maximum Concentration: As permitted by applicable code.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Foundation Walls: 3,000 psi 28 day concrete, form finish with honeycomb filled surface.

B. Underside of Supported Floors and Structure Exposed to View: 4,000 psi 28 day concrete, sack rubbed finish.

C. Exposed Portico Structure: 4,000 psi 28 day concrete, air entrained, smooth stone rubbed finish.

3.10 SCHEDULE - JOINT FILLERS

A. Basement Floor Slab Perimeter:Joint filler Type A set 1/8 inch below floor slab elevation.

B. Exterior Retaining Wall at Loading Dock: Joint filler Type F recessed 3/8 inch with sealant cover.

END OF SECTION

DIVISION 03 CONCRETE
03 35 00 CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Finishing concrete floors [and floor toppings].
   2. Floor surface treatment.

B. Related Sections:
   1. Section 033000 - Cast-in-Place Concrete: [Prepared concrete floors ready to receive finish;] [control and formed expansion and contraction joints and joint devices].
   2. Section 03360 - Concrete Finishes: Exposed aggregate finish.
   3. Section 033900 - Concrete Curing.
   4. Section 079513 - Expansion Joint Cover Assemblies.
   5. Section 079200 - Joint Sealers.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

B. ASTM International:
   1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on concrete hardener, sealer, curing compounds curing papers and slip resistant treatment, compatibilities, and limitations.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

1.8 COMPOUNDS - HARDENERS AND SEALERS

A. Chemical Hardener: Magnesium fluorosilicate and zinc fluorosilicate blend

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify floor surfaces are acceptable to receive the Work of this section.

2.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. Wood float surfaces receiving quarry tile, ceramic tile, and cementitious terrazzo with full bed setting system.

C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set quarry tile, and thin set ceramic tile.

D. Steel trowel surfaces which are scheduled to be exposed.

2.3 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.

C. Finish concrete to achieve the following tolerances:
1. Under Glazed Tile on Setting Bed: F(F) 35 and F(L) 20.
2. Under Resilient Finishes: F(F) 75 and F(L) 50.
3. Exposed to View and Foot Traffic: F(F) 75 and F(L) 40.

4. Correct slab surface when actual F(F) or F(L) number for floor installation measures less than required.

D. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

DIVISION 03 CONCRETE
03 39 00 CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes initial and final curing of horizontal and vertical concrete surfaces.

B. Related Sections:
   1. Section 033000 - Cast-In-Place Concrete.
   2. Section 033500 - Concrete Finishing.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
   3. ACI 308.1 - Standard Specification for Curing Concrete.
   4. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
   2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
   4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on curing compounds, mats, paper, film, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type 1.

B. Membrane Curing Compound: ASTM C1315 Type I.

C. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

A. Cure concrete in accordance with ACI 308.1.

B. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

****** [OR] ******

C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

****** [OR] ******

D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.

****** [OR] ******

E. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.

3.3 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Protecting finished Work.

B. Do not permit traffic over unprotected floor surface.

3.4 SCHEDULES

A. Storage Area Slabs: Absorptive mats, burlap-polyethylene type.

B. Retaining Walls: Membrane curing compound, acrylic type, clear color.

C. Concrete Pavement: Membrane curing compound, opaque color.

D. Other Floor Areas: Membrane curing compound, acrylic type, translucent color.

END OF SECTION

DIVISION 3 CONCRETE
03 60 00 GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Portland cement grout.
   2. Rapid curing epoxy grout.
   3. Non-shrink cementitious grout.

B. Related Sections:
   1. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society of Testing and Materials:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
   5. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes.
   8. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
   1. CRD C621 - Non-Shrink Grout.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
a. Corrosion of steel.
b. Volume change increasing shrinkage cracking.
c. Efflorescence.
d. Excess air entraining.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

A. Rapid Curing Epoxy Grout: High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalies.

Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	30x10-6 in per degree F
Shrinkage	ASTM C827	None

2.3 NON-SHRINK CEMENTITIOUS GROUT

A. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)
Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.4 FORMWORK

A. Refer to Section 031000 for formwork requirements.

2.5 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.2 MIXING

A. Portland Cement Grout:
   1. Use proportions of 2 parts sand and 1 part cement, measured by volume.
   2. Prepare grout with water to obtain consistency to permit placing and packing.
   3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water;after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
   4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
   5. Do not add additional water after grout has been mixed.
   6. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.

****** [OR] ******

3.3 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.4 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.5 FIELD QUALITY CONTROL

A. Submit proposed mix design of each class of grout to inspection and testing firm for review prior to commencement of Work.

B. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

DIVISION 04 MASONRY
04 05 14 MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes mortar and grout for masonry.

B. Related Sections:
1. Section 042000 - Unit Masonry Assemblies: Installation of mortar and grout.
2. Section 042016 - Reinforced Unit Masonry Assemblies: Installation of mortar and grout.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 530 - Building Code Requirements for Masonry Structures.
2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International:
1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
2. ASTM C91 - Standard Specification for Masonry Cement.
3. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
4. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
8. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
10. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
11. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
12. ASTM C476 - Standard Specification for Grout for Masonry.
13. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
15. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
17. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
18. ASTM C1329 - Standard Specification for Mortar Cement.

19. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal requirements.

B. Design Data: Submit design mix when Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements.

B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Portland Cement: ASTM C150, Type I

B. Calcium chloride is not permitted.

2.2 MIXES

A. Mortar Mixes:
1. Extended Life Mortar: ASTM C1142, Type RS

B. Mortar Mixing:
1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
2. Achieve uniformly damp sand immediately before mixing process.
3. Re-temper only within two hours of mixing.

C. Grout Mixes:

1. Grout for Non-Structural Masonry: 3,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 grout.
2. Grout for Structural Masonry: 3,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 grout.
3. Application:
   a. Coarse Grout: For grouting spaces with minimum 4 inches dimension in every direction.
   b. Fine Grout: For grouting other spaces.

D. Grout Mixing:
1. Mix grout in accordance with ASTM C94/C94M, modified to use ingredients complying with ASTM C476.
2. Add admixtures; mix uniformly.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Request inspection of spaces to be grouted.

3.2 INSTALLATION

A. Install mortar and grout in accordance with ACI 530.1 Specifications for Masonry Structures.

3.3 FIELD QUALITY CONTROL

A. Establishing Mortar Mix: In accordance with ASTM C270.

B. Testing Frequency: One set of specified tests for every 5,000 sf of completed wall area.

C. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.

D. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143/C143M for slump.

E. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

END OF SECTION

DIVISION 4 MASONRY
04 20 16 REINFORCED UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete masonry units, reinforcement, anchorage, and accessories.

B. Related Sections:
1. Section 040514 - Masonry Mortar and Grout: Mortar and grout.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 530 - Building Code Requirements for Masonry Structures.
2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International:
1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
4. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
7. ASTM A951 - Standard Specification for Masonry Joint Reinforcement.
8. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
9. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
10. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.
11. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile.
12. ASTM C55 - Standard Specification for Concrete Brick.
13. ASTM C56 - Standard Specification for Structural Clay Non-Load-Bearing Tile.
14. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).

15. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
16. ASTM C73 - Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
17. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
18. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
19. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
20. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
21. ASTM C212 - Standard Specification for Structural Clay Facing Tile.
22. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
23. ASTM C315 - Standard Specification for Clay Flue Linings.
24. ASTM C530 - Standard Specification for Structural Clay Non-Loadbearing Screen Tile.
25. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
26. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
27. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
28. ASTM C1261 - Standard Specification for Firebox Brick for Residential Fireplaces.
29. ASTM C1283 - Standard Practice for Installing Clay Flue Lining.
30. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
31. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

C. National Fire Protection Association:
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc.:
   1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength
   1. Concrete Masonry Units: 1900 psi minimum net area compressive strength.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement.

C. Product Data:
1. Submit data for masonry units and fabricated wire reinforcement.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements.

B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90; normal weight.

2.2 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951; ladder type; 0.148 inch diameter side rods with 0.148 inch diameter cross ties.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars.

C. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped; complete with washers and heavy hex nuts; sized for minimum 15 inch embedment.
1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 55.

D. Mortar and Grout: As specified in Section 04065.

E. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Test brick efflorescence in accordance with ASTM C67. Brick rated greater than “slightly effloresced” is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

C. Wet clay and shale brick before laying when initial rate of absorption is greater than 30 grams when tested in accordance with ASTM C67.

3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Placing And Bonding:
1. Lay solid masonry units in full bed of mortar, with full head joints.
2. Lay hollow masonry units with face shell bedding on head and bed joints.
3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
4. Remove excess mortar as Work progresses.
5. Interlock intersections and external corners.
6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
7. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
8. Isolate masonry from vertical structural framing members with movement joint .
9. Isolate top of masonry from horizontal structural framing members and slabs or decks.

E. Joint Reinforcement And Anchorage:
1. Install horizontal joint reinforcement 16 inches oc.
2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
3. Place joint reinforcement continuous in first and second joint below top of walls.
4. Lap joint reinforcement ends minimum 6 inches.
5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
6. Embed anchors embedded in concrete attached to structural steel members. Embed anchorages in every sixth brick.

F. Lintels:
1. Install precast concrete lintels over openings.
2. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.
3. Openings Up To 42 inches Wide: Reinforce openings as indicated on Drawings.
4. Openings From 42 inches Up To 78 inches Wide: Reinforce openings as indicated on Drawings.
5. Openings Over 78 inches: Reinforce openings as indicated on Drawings.
6. Do not splice reinforcing bars.
7. Support and secure reinforcing bars from displacement.
8. Place and consolidate grout fill without displacing reinforcing.
9. Allow masonry lintels to attain specified strength before removing temporary supports.
10. Maintain minimum 8 inches bearing on each side of opening.

G. Grouted Components:
1. Reinforce bond beam with 1, No. 5 bar.

2. Reinforce pilaster with 1, No. 6 bar in each cell.
3. Lap splices bar diameters required by code.
4. Support and secure reinforcing bars from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. At bearing locations, fill masonry cores with grout for minimum 12 inches either side of opening.

H. Reinforced Masonry:
1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
2. Place reinforcing, reinforcement bars, and grout as indicated on Drawings.
3. Splice reinforcement in accordance with Section 03200.
4. Support and secure reinforcement from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.

I. Control And Expansion Joints:
1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:
   a. Exterior Walls: 20 feet on center and within 10 feet on one side of each interior and exterior corner.
   b. Interior Walls: 30 feet on center.
   c. At changes in wall height.
2. Do not continue horizontal joint reinforcement through control and expansion joints.
3. Install preformed control joint device in continuous lengths. Seal butt and corner joints.
4. Size control joint in accordance with Section 07900 for sealant performance.
5. Form expansion joint by omitting mortar and cutting unit to form open space.

J. Cutting And Fitting:
1. Obtain Architect/Engineer’s approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Alignment of Pilasters: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

I. Maximum Variation for Steel Reinforcement:
   1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
   2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
   3. Plus or minus 1 inch when distance is between 8 and 24 inches.
   4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
   5. Plus or minus 2 inches from location along face of wall.

3.5 FIELD QUALITY CONTROL

A. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.6 CLEANING

A. Section 017000 - Execution Requirements: Final cleaning.

B. Remove excess mortar and mortar smears as work progresses.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.7 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Requirements for protecting finished Work.

B. Protect exposed external corners subject to damage.

C. Protect base of walls from mud and mortar splatter.

D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

E. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

DIVISION 5 METALS
05 12 00 STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural shapes.
2. Channels and angles.
3. Hollow structural sections.
4. Structural pipe.
5. Structural plates and bars.
6. Fasteners, connectors, and anchors.
7. Fasteners, connectors, and anchors.
8. Grout.

B. Related Sections:
1. Section 036000 - Grout: Grout for setting base plates.
2. Section 052100 - Steel Joists.
3. Section 053123 - Steel Roof Deck
4. Section 055000 – Metal Fabrications: Steel Fabrications affecting structural steel work.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
3. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
4. AISC Seismic Provisions for Structural Steel Buildings.
5. AISC Specification for Allowable Stress Design of Single-Angle Members.
6. AISC Specification for the Design of Steel Hollow Structural Sections.
7. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
8. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
10. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
11. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
14. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
15. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
19. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
20. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
23. ASTM A913/A913M - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
24. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
25. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
26. ASTM E94 - Standard Guide for Radiographic Examination.
27. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

28. ASTM E165 - Standard Test Method for Liquid Penetrant Examination.
29. ASTM E709 - Standard Guide for Magnetic Particle Examination.
30. ASTM F436 - Standard Specification for Hardened Steel Washers.
31. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
32. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
33. ASTM F1852 - Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Paint.
3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
2. Connections.
3. Cambers
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Mill Test Reports: Submit indicating structural strength and destructive and non-destructive test analysis.

D. Manufacturer’s Mill Certificate: Certify products meet or exceed specified requirements.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualifications within previous 12 months.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Code of Standard Practice for Steel Buildings and Bridges. Section 10.
3. AISC Seismic Provisions for Structural Steel Buildings.
4. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
5. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
6. AISC Specification for the Design of Steel Hollow Structural Sections.
7. AISC Specification for Allowable Stress Design of Single-Angle Members.
8. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
9. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
10. ASCE 19.

1.5 COORDINATION

A. Section {013000 - Administrative Requirements}: Requirements for coordination.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992/A992M; Grade 50

B. Structural M-Shapes: ASTM A36/A36M; Grade 50

C. Structural T-Shapes: Cut from structural W-shapes.

D. Channels and Angles: ASTM A36/A36M.

E. Round Hollow Structural Sections: ASTM A500, Grade B.

F. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.

G. Structural Plates and Bars: ASTM A36/A36M.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Bolts: ASTM A307; Grade A or B.
   1. Finish: Unfinished

B. High Strength Bolts: ASTM A325; Type 1 or ASTM A490; Type 1.
   1. Finish: Unfinished

C. Nuts: ASTM A563 heavy hex type.
   1. Finish: Unfinished

D. Washers: ASTM F436; Type 1, circular
   1. Finish: Unfinished

E. Threaded Rods: ASTM A36/A36M; Grade A.
   1. Finish: Unfinished

F. Forged Structural Steel Hardware:
   1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
   2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
   3. Sleeve Nuts: ASTM A108; Grade 1018.
   4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

2.3 WELDING MATERIALS

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

2.4 ACCESSORIES

A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days

B. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.5 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.6 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 3.

B. Shop prime structural steel members.

C. Galvanizing for Structural Steel Members: ASTM A123/A123M; minimum 1.2 oz/sq ft coating thickness; galvanize after fabrication.

D. Galvanizing for Fasteners, Connectors, and Anchors:
1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Shop test bolted and welded connections as specified for field quality control tests.

C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify bearing surfaces are at correct elevation.

C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

A. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components and shear connectors indicated on Drawings.

C. Field connect members with threaded fasteners; tighten to snug tight for bearing type connections.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

A. Grout [under base plates in accordance with Section 036000.

B. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.

C. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

D. Moist cure grout.

E. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45 degrees.

F. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Bolted Connections: Inspect in accordance with AISC specifications.
   1. Visually inspect all bolted connections.

2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.

C. Welding: Inspect welds in accordance with AWS D1.1.
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Visually inspect all welds.
3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
4. Liquid Penetrant Inspection: ASTM E165.

D. Correct defective bolted connections and welds.

END OF SECTION

DIVISION 31 SITE CONSTRUCTION
31 23 16 EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil densification.
2. Excavating for building foundations.
3. Excavating for slabs-on-grade.
4. Excavating for site structures.

B. Related Sections:
1. Section 310513 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 310516 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 312213 - Rough Grading: Topsoil and subsoil removal from site surface.
4. Section 312318- Rock Removal: Removal of rock during excavating.
5. Section 312323- Backfill.
6. Section 312317 - Trenching: Excavating for utility trenches.

1.2 REFERENCES

A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Local utility standards when working within 24 inches of utility lines.

PART 2 EXECUTION

2.1 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate building foundations, slabs-on-grade.

C. Excavate to working elevation for piling work.

D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02320 and Section 02324.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Notify Architect/Engineer of unexpected subsurface conditions.

H. Correct areas over excavated with structural fill.

I. Remove excess and unsuitable material from site.

J. Repair or replace items indicated to remain damaged by excavation.

2.2 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION