PUBLIC SAFETY CENTER

PROJECT MANUAL

GIGNAC & ASSOCIATES
416 STARR STREET
CORPUS CHRISTI, TEXAS 78401
(361) 884-2661

GIGNAC | ARCHITECTS

PROJECT NO. GIGNAC-18.22

May 18,2023

TITLE PAGE

TITLE AND LOCATION OF THE WORK

PUBLIC SAFETY CENTER
PORT ARANSAS, TEXAS

NAME & ADDRESS OF THE OWNER

CITY OF PORT ARANSAS
710 W. AVENUE A
PORT ARANSAS, TX 78373

NAME & ADDRESS OF THE ARCHITECT

GIGNAC ARCHITECTS, LLP
416 STARR STREET
CORPUS CHRISTI, TEXAS 78401

TITLE OF DOCUMENTS BOUND HEREWITH

TITLE PAGE
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CONTRACT DOCUMENTS

PROJECT NUMBER: 18.22

DATE: MAY 18, 2023

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A. Architect:
   1. Raymond D. Gignac, Gignac Architects.
   2. TBAE #6296.

B. Civil Engineer:
   1. Stephen Grunewald, PE, Urban Engineers.
   2. TBPE #86927.

C. Landscape Architect:
   1. Alexis Dominguez, ADLA
   2. TBAE #2668

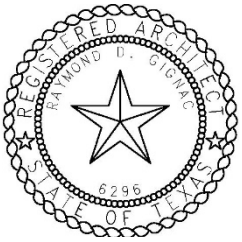
D. Structural Engineer:
   1. Rolando Rubiano, Green-Rubiano & Associates.
   2. TBPE #86369.

E. Plumbing Engineer:
   1. Ian C. Vohwinkle, MS2 Engineering.
   2. TBPE #103809.

F. HVAC Engineer:
   1. Ian C. Vohwinkle, MS2 Engineering.
   2. TBPE #103809.

G. Electrical Engineer:
   1. Patrick J. Howard, MS2 Engineering.
   2. TBPE #106064.

END OF DOCUMENT 00 01 07



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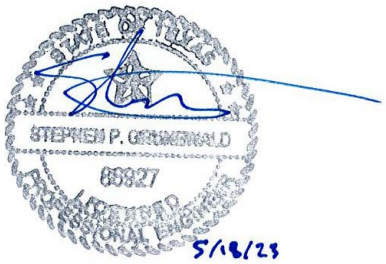

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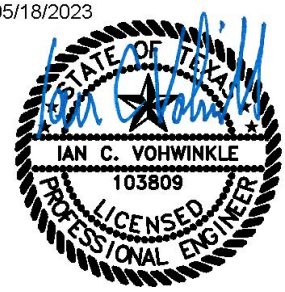

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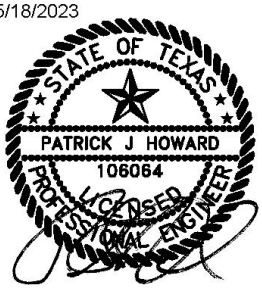

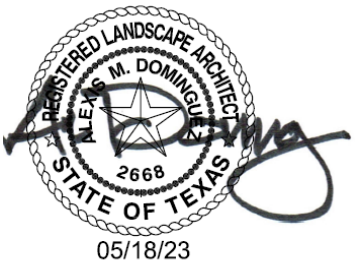

05/18/23

CITY OF PORT ARANSAS, TEXAS

REQUEST FOR PROPOSALS (RFP)
PUBLIC SAFETY CENTER

NOTICE TO BIDDERS

Notice is hereby given that the City of Port Aransas, Texas is requesting bids for the construction of a new PUBLIC SAFETY FACILITY AND ASSOCIATED SITE WORK. All bids must be clearly marked **"SEALED BID – PUBLIC SAFETY CENTER"** to the City of Port Aransas City Secretary's Office, 710 W. Avenue A, Port Aransas, Texas prior to Thursday, June 22, 2023 at 2:00 p.m., at which time they will be publicly opened and acknowledged in the City Hall Council Chamber. Any bid delivered or not received by 2:00 p.m. will not be considered and shall be returned unopened to the addressee. The City reserves the right to reject any or all bids.

The project consists of the construction of a new Public Safety facility and associated sitework. Bidders must submit a Cashier's or Certified Check issued by a bank satisfactory to City of Port Aransas, or a Proposal Bond from a reliable surety company, payable to City of Port Aransas in an amount not less than five percent (5%) of the bid submitted as a guaranty that the Bidder will enter into a contract using the forms provided within ten (10) days after notice of award to contract to him. To obtain Construction Documents and to be added to the bidders list, email Paul Rybalka, Project Manager at Gignac Architects at prybalka@gignac-associates.com

A pre-bid conference will be held on Thursday, June 08, 2023 at 2:00 pm at City of Port Aransas City Council Chambers.

Questions or requests for information relating to this request for bid may be directed to Paul Rybalka, Project Manager for this project, via email at prybalka@gignac-associates.com, no later than 2:00 p.m. Thursday, June 15, 2023.

POSTED this 18th day of May, 2023 on the bulletin board at Port Aransas City Hall, 710 W. Avenue A, Port Aransas, Texas and on the webpage www.cityofportaransas.org. **TIME: 5:00 p.m. PUBLISHED** in the South Jetty in the Thursday, May 18, 2023 edition.

CITY OF PORT ARANSAS, TEXAS

_____

Francisca Nixon, City Secretary

DOCUMENT 002110 - BID FORMAT

1. COMPETITIVE BIDS SUBMITTALS
   A.) The Competitive Bids shall consist of one (1) original and five (5) copies and shall include the information and forms requested by this Request for Bids. Once submitted, the Bids become the property of City of Port Aransas. It is the responsibility of the bidder to make copies for their files. Submitted Bids shall be bound neatly and in and organized manner. DO NOT submit as individual sheets/or pages.
2. BUDGET
   A.) The Proposed construction budget amount for Base Bid is $9,000,000.00.
3. COMPETITIVE BIDS
   A.) Competitive Bids
      a. Complete all submittals of Competitive Bids. Completed packets must be submitted in a sealed envelope and the envelope must be marked:
         PROJECT: **NEW PUBLIC SAFETY CENTER**, City of Port Aransas, 300 J. C. Bar Blvd., Port Aransas, TX 78373
         Bidder's Name:
         _____
      b. Bid Price and apparent completeness of the Competitive Bids will be opened and publicly read at the date, time and location noted on the schedule. City of Port Aransas reserves the right to accept or reject any or all Bids.
      c. Bids shall include furnishing of all labor, materials and equipment and performing all work required and shall be based upon Contract Documents prepared by Gignac & Associates.
      d. Should the Competitive Bids be mailed, it is the responsibility of the Bidder to allow enough time in transit for Bid to be received by Owner prior to date and hour of the deadline. Only the Supplemental Bid Form may be faxed or e-mailed to the Owner with a copy to the Project Architect.
      e. Bids received shall be kept securely sealed until the stated time of opening. The Owner's representative, whose duty is to open them, will decide when the specified time has arrived, and no Bid received thereafter will be considered. The owner or his representatives will not be responsible for the premature opening of, or the failure to open a Bid not properly addressed or identified.
      f. In case of ambiguity or lack of clarity in the stated price in the Bid, the Owner will adopt the price written in words.
      g. Any Bid which is not based upon the drawings and specifications, or which contains any qualification of same, or which is not properly completed and signed by the Bidder, may be rejected by the Owner.
4. EVALUATION OF COMPETITIVE BIDS
   A.) Within seven (7) days after the opening of the Competitive Bids, the Owner and the Project Architect shall review all required information. The owner reserves the right to waive any irregularities as long as they do it for all Bidders.
5. BIDDER'S REPRESENTATIONS
   A.) By submitting the Competitive Bids, the Bidder represents that:
      a. The Bidder accepts the right of the Owner to reject the Bid, to waive informalities, and to accept the Bid which the Owner considers most advantageous to the owner;
      b. The Bidder furnishes a bid of security bid bond in the amount of five percent (5%) of the Base Bid Amount
      c. The Bidder, if awarded, furnishes specified insurance
      d. The Bidder, if awarded, obtains all permits as required by local, state and federal agencies having jurisdiction over this project.
      e. The Bidder, if awarded, agrees to the terms and conditions set forth in the agreements included in this request for Bids.
      f. The Bidder, if awarded, furnishes a one hundred percent (100%) Statutory Performance and Statutory Payment Bond
      g. Start the work within five (5) calendar days of "Notice to Proceed".
      h. The Bidder shall accomplish the work in accordance with the Contract Documents within the Contract Time and Agrees to be subject to Liquidated Damages.

i. The Bidder has been made aware of the School District's school calendar for the current school year and that work may be required to be limited on certain days.

6. BID SURETY
   A.) Each Bid shall be accompanied by a Bid Security ("Bid Bond") on AIA document A310 in the amount of five percent (5%) of the Base Price Bid Amount. This bond shall be paid to the Owner in the event that the Bidder, if awarded the contract, should fail within seven (7) days following the award to execute and return the contract, together with the Performance and Payment Bonds with acceptable surety.
7. VISIT TO SITE
   A.) There will be no funds paid to the Contractor associated with conditions which would have been determined by examining the site and Contract Documents before submission to Bid.
8. BID ACCURACY
   A.) Each Bidder warrants that his/her competitive sealed Bid contains true, correct and complete information, and that the Bidder will make no claim for omission or error.
9. RESERVATION OF RIGHTS
   A.) The Owner reserves the right to reject any and all Competitive Bids, and to waive any informality or irregularity in Bids when such rejection or waiver is in the best interest of the Owner. Moreover, the Owner reserves the right to accept any base Bid and or alternates.
10. TERMINATION OF BID
    A.) No Bid shall be withdrawn or terminated for a period of sixty (60) days subsequent to the opening of Bids without consent of the owner except if a Bid was accepted and a contract executed or all Bids were rejected.
11. PRICING
    A.) Bid prices may not be changed after opening of Bid has occurred.
    B.) In accordance with the Texas Education Code and Texas Government Code, the Owner and the Project Architect may discuss with the selected Bidder options for a scope or time modification and any price change associated with such modification.
    C.) All prices for supplies and materials shall be quoted F.O.B. Destination.
12. REQUESTS FOR CLARIFICATION AND/OR INTERPRETATION
    A.) Requests for clarification and/or interpretation of the Contract Documents must be in writing and forwarded via E-mail to all of the following:

Paul Rybalka, Project Manager	Mr. David Parsons, City Manager
Gignac Architects	City of Port Aransas
prybalka@gignac-associates.com	davidparsons@cityofportaransas.org

    A.) All changes and/or additional to the project documents shall be done by a written Addendum published by the Project Architect to all Plan Holders, and such Addendum(s) shall become a part of the Contract Documents.
    B.) All other oral or written interpretation, or explanations, corrections and/or approvals, do not constitute a change to the project documents, and therefore, should not be relied upon as such.
13. SUBSTITUTIONS AND ALTERNATE MANUFACTURES
    A.) DEVIATING FROM SPECIFICATIONS SHALL REQUIRE PRIOR APPROVAL BY PROJECT ARCHITECT BEFORE SUBMISSION.
14. SALES TAX
    A.) The Owner qualifies for exemption from State and local Sales Taxes pursuant to the provisions of the Texas Limited Sales, Excise, and Use Tax Act, Texas Tax Code ,Chapter 151. The General Contractor may claim exemption from payment of application State Sales Taxes by complying with such procedures as may be prescribed by the State Comptroller of Public Accounts.
15. SURETY
    A.) "Acceptable surety" is defined as an insurance company, duly authorized to do business in the State of Texas and license by the State of Texas to issue surety bonds and having an A.M. BEST Rating of A or better, in the opinion of Owner, for faithful performance during the preceding five years of all undertaking to Owner. Notwithstanding any other law to the contrary the Owner may establish financial criteria for the Surety Companies that provide Statutory Payment and Statutory Performance Bonds.
    B.) Statutory Payment and Statutory Performance Bonds will be required on this project. The successful Bidder must deliver to the Owner a fully executed Statutory Performance and Statutory payment Bond in an amount of one hundred percent (100%) of the accepted Bid as security for

the faithful performance of the contract and payment of all persons performing labor and furnishing materials in connection with this contract. The Statutory Performance and Statutory Payment Bonds shall meet the requirements of Texas Government Code Chapter 2253 as amended. All bonds shall be issued on Statutory Performance Bond and Statutory Payment Bonds forms, by a surety company licensed, listed, and authorized to issue bonds in the State of Texas by the Texas by the Texas Department of insurance. The Surety Company shall also provide such other information as may be necessary to document net worth, stability, total bonding capacity, and other projects under coverage and to establish adequate financial capacity for this project under coverage. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, the surety company issuing the bond shall certify that the surety company has acquired reinsurance in a form and amount acceptable to the Owner to reinsure the portion of risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by any reinsurer does not exceed (10%) of the reinsurer's capital and surplus.

C.) The Contractor shall require any attorney-in-fact who executed the required bonds in behalf of the surety to affix thereto an original certified and current copy of a Power of Attorney evidencing the authority of such attorney-in-fact to so execute such bonds within the State of Texas indicating the monetary limit of such power and authority.

16. CONTRACT FORMS
    A.) Refer to Division 00, Agreements & Bond Forms to be used to execute the Agreement between the Owner and Contractor. By submitting a Bid, the Contractor agrees to all terms and conditions set forth in the request for Bids.
17. RETAINAGE
    A.) The Owner will allow NINETY FIVE PERCENT (95%) progress payment for General Conditions, materials and labor for the duration of the contract.
18. OWNER
    A.) Whenever the term "Owner" is used in this specification, it shall refer to City of Port Aransas, Por Aransas, Texas. All papers required to be delivered to the Owner, unless otherwise indicated, shall be delivered to Mr. David Parsons, City Manager, 710 W. Ave A, Port Aransas, TX 78373. Hand delivery or courier to same address. Mr. David Parsons has been delegated the authority to receive, review, and rank all Bids. This authority may be exercised by Mr. David Parsons alone or with the assistance of any employee, design professional, or consultant selected by Mr. David Parsons. The final decision on ranking and selection of Contractors remains with the City Council.
19. ARCHITECT
    A.) Whenever the term "Architect" is used in this specification, it shall refer to Gignac & Associates, 416 Starr Street, Corpus Christi, TX 78410 who by contract is authorized by the owner to prepare all contract documents.
20. APPLICABLE LAW
    A.) This agreement shall be governed by the laws of the State of Texas.
21. VENUE
    A.) All parties agree that venue for any litigation arising from this contract/project shall lie in Aransas County, Texas
22. CLAIMS
    A.) By submitting a Bid, each Bidder agrees to waive any claim it has or may have against the Owner the Architect, and their respective employees and officers, arising out of or in connection with the administration evaluation, or recommendation of any Bid; waiver of any requirements under the Bid Documents; or the Contract Documents; acceptance or rejection of any Bids; and award of the Contract.
23. WORKERS COMPENSATION
    A.) REQUIRED WORKERS' COMPENSATION COVERAGES 28 TAC 110.110(c)(7), adopted to implement Texas Labor Code 406.096
    B.) The District shall use the following language for Bid specifications and contracts for building or construction, without any additional words or changes, except those required to accommodate the specific document in which they are contained or to impose stricter standards of documentation.
    C.) A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Department of Insurance (TDI), or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-

84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project is required for the duration of the project.

D.) Duration of the project includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

E.) Persons providing services on the project ("subcontractor" in Texas Labor Code 406.096) include all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the project.

F.) Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. Services do not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

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

H.) The contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

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

J.) The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

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

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

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

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

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

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

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

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

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

Q.) Obtain from each other person with whom it contracts, and provide to the contractor:

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

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

c. Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and Contractually require each person with whom it contracts to perform as required by items 1–6, with the certificates of coverage to be provided to the person for whom they are providing services.

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

S.) The contractor's failure to comply with any of these provisions is a breach of contract by the contractor that entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

T.) The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996.

28 TAC 110.110(i)

26. PREVAILING WAGE RATE

A.) The Port Aransas City Council has adopted and specifies the attached prevailing wage rate schedule as the prevailing wage rate for all work to be performed on the Project. Reference SECTION 007343 –WAGE RATE REQUIREMENTS AND 007346 WAGE DETERMINATION SCHEDULE.

B.) The contractor to whom the contract is awarded, or any subcontractors of the contractor shall pay not less than the specified rates to all laborers, workers, and mechanics employed in the execution of the contract. A contractor or subcontractor who fails to pay the specified rates as required shall pay to the District $60 for each worker, laborer, or mechanic employed for each calendar day or part of a calendar day the worker is paid less than the wage rates specified in the contract.

END OF DOCUMENT 002110

REFERENCES - MOST RECENTLY COMPLETED PROJECTS

NEW PUBLIC SAFETY CENTER
City of Port Aransas
300 J. C. Barr Blvd. E Avenue C, Port Aransas, TX 78373

Bidder must submit three (3) most recently completed project references similar in size, scope and cost giving the names and location of project, contract amount, change orders and completion date. Include name of Owner and Architect and their contact person with phone number. Failure to provide requested references shall cause Bid to be deemed non- responsive.

1	Name & Location:	
	Contract Amount:	
	Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

2	Name & Location:	
	Contract Amount:	
	Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

3	Name & Location:	
	Contract Amount:	
	Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

The Bidder authorizes the Owner or Architect to contact the references listed above.

Bidder Company Name/Signature: _____

REFERENCES - CURRENT PROJECTS

NEW PUBLIC SAFETY CENTER
City of Port Aransas
300 J. C. Barr Blvd. E Avenue C, Port Aransas, TX 78373

Bidder must submit three (3) current project references your organization has in progress, giving the names and location of project, contract amount, percent complete and scheduled completion date. Include name of Owner and Architect and their contact person with phone number. Failure to provide requested references shall cause Bid to be deemed non-responsive.

1	Name & Location:	
	Contract Amount:	
	Percent Complete	
	Schedule Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

2	Name & Location:	
	Contract Amount:	
	Percent Complete	
	Schedule Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

3	Name & Location:	
	Contract Amount:	
	Percent Complete	
	Schedule Completion Date:	
	Owner Point of Contact:	
	Architect Point of Contact:	

The Bidder authorizes the Owner or Architect to contact the references listed above.

Bidder Company Name/Signature: _____

A CONFLICT OF INTEREST QUESTIONAIRE, FORM CIQ, is required to be completed and signed. The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

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

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

(2) the date the vendor becomes aware:

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

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

Texas Local Government Code §176.006.

All related costs including background checks/fingerprinting shall be at the contractor's expense.

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____
Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

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

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

NON-COLLUSION STATEMENT & SIGNATURE SHEET

The undersigned affirms that he/she is duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this Bid in collusion with any other Offeror, and that the contents of this Bid as to prices, terms or conditions of said Bid have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this Bid.

Further, I affirm that prior to or after the opening of this Bid, I (or any representative of my company) will not discuss the contents of this Bid with any person affiliated with the City of Port Aransas, other than the City Manager or his City of Port Aransas Designee prior to the awarding of this Bid. I understand that failure to observe this procedure may cause my Bid to be rejected.

I also affirm that no officer or stockholder of the offeror (bidder) is a member of the staff, or related to any employee or City of Port Aransas **except** as noted herein_____
_____
.

By signing this Bid, vendor makes the assurance that vendor has not been debarred or suspended from conducting business with the U. S. Government according to Executive Order 12549 entitled "Debarment and Suspension."

I, _____, **(Print/Type Name of Company Officer)** have read the standard terms and conditions and insurance and bonding requirements, I fully understand them, and will fully execute them if I am awarded this Bid.

I have represented the truth concerning the felony conviction notification. **I have checked off one of the three statements on the attached felony conviction notification form. I have also signed the form.**

I fully understand the Bid (project) specifications.

COMPANY _____ EMPLOYER I. D. No._____

ADDRESS _____

CITY, STATE, ZIP CODE _____

TELEPHONE/FAX ( )_____/_____ EMAIL ADDRESS_____

_____	_____	_____
SIGNATURE	TITLE	DATE

LIST OF SUBCONTRACTORS

Project: **NEW PUBLIC SAFETY CENTER**
City of Port Aransas
300 J. C. Barr Blvd. E Avenue C, Port Aransas, TX 78373
Architect: Gignac Architects Architect Project No.:18.22

Contractor: Date:

Address:

Address:

List Subcontractors and others proposed to be employed on the above Project as required by the Bid documents. To be filled out the Contractor and returned with sealed Bid.

Work/Firm	Address	Phone	Representative

(Provide additional sheets as required)

END OF DOCUMENT 00 21 00

DOCUMENT 00 21 13 - INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A701, "Instructions to Bidders," is bound in this Project Manual.

END OF DOCUMENT 002113

AIA® Document A701™ – 2018

Instructions to Bidders

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

NEW PUBLIC SAFETY CENTER

THE OWNER:
(Name, legal status, address, and other information)

City of Port Aransas
710 W. Avenue A
Port Aransas, TX 78373
Telephone Number: 361.749.4111
Fax Number: 361.749.4723

THE ARCHITECT:
(Name, legal status, address, and other information)

Gignac & Associates, Limited Liability Partnership
416 Starr St.
Corpus Christi, Texas 78401
Telephone Number: 361-884-2661
Fax Number: 361-884-4232

TABLE OF ARTICLES

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7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount

of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

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

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.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.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

DOCUMENT 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO PROPOSERS

A. Instructions to Proposers for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders, a copy of which is bound in this Project Manual.
2. The following Supplementary Instructions to Proposers that modify and add to the requirements of the Instructions to Proposers.

1.2 SUPPLEMENTARY INSTRUCTIONS TO PROPOSERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Proposers is modified or deleted by these Supplementary Instructions to Proposers, unaltered portions of the Instructions to Proposers shall remain in effect.

1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.4.1:

1. 2.1.4.1 - The Proposer has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.7:

1. 2.1.7 - The Proposer is a properly licensed Contractor according to the laws and regulations of State of Texas, Nueces County, City of Port Aransas and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.8:

1. 2.1.8 - The Proposer has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:
    a. 3.2.2.1 - Submit Proposer's Requests for Interpretation using form bound in the Project Manual.

B. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:
    a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.
2. Add Section 3.4.4.1:
    a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:
        1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
        2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:
    a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from Architect.
2. Add Section 4.1.9:
    a. 4.1.9 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.
3. Add Section 4.1.10:
    a. 4.1.10 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Proposer of any alternates, conditions, limitations or provisions not called for.
4. Add Section 4.1.11:
    a. 4.1.11 – Owner is a tax-exempt entity. No bids shall include sales and use taxes.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

a. 4.3.1.2 - Include Proposer's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.1:

a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Proposer. Authorized persons are those so identified in the Proposer's corporate bylaws, specifically empowered by the Proposer's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

b. 4.4.1.2 - Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Proposer, does not require power of attorney due to the evidenced authorization of the Proposer implied by the circumstance of the completion and delivery of the Bid.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Add Section 4.5:

a. 4.5 - Provide detailed cost breakdowns no later than two business days following Architect's request.

E. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

1. Add Section 4.6:

a. 4.6 - Provide with the proposal, list of major subcontractors, suppliers, and manufacturers furnishing or installing products. Include those subcontractors, suppliers, and manufacturers providing work totaling three percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.6 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Proposer's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Proposer's proposed Project staff and proposed subcontractors.

1.7 ARTICLE 6 – POST-BID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

a. 6.1.1 - Submit Contractor's Qualification Statement with proposal.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 with proposal.

1.8 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:

a. The Proposer shall deliver the required bonds to Owner no later than 10 days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever

occurs first. Owner may deem the failure of the Proposer to deliver required bonds within the period of time allowed a default.

2. Delete Section 7.2.3 and insert the following:
    a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.9 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Architect, in such number of counterparts as Owner may require.
2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement or the date that the Proposer is obligated to deliver the executed Agreement and required bonds to Owner.
4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible Proposer or re-advertise for proposals.

END OF DOCUMENT 002213

DOCUMENT 00 25 13 - PREBID MEETINGS

1.1 PREBID MEETING

A. Owner and Architect will conduct a Prebid meeting as indicated below:
   1. Meeting Date: Thursday, June 8, 2023.
   2. Meeting Time: 2:00 p.m., local time.
   3. Location: City of Port Aransas City Council Chambers

B. Attendance:
   1. Prime Bidders: Attendance at Prebid meeting is recommended.
   2. Subcontractors: Attendance at Prebid meeting is recommended.
   3. Notice: Bids will only be accepted from prime bidders represented on Prebid Meeting sign-in sheet.

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.

D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
   1. Procurement and Contracting Requirements:
      a. Instructions to Bidders.
      b. Bonding.
      c. Insurance.
      d. Bid Security.
      e. Bid Form and Attachments.
      f. Notice of Award.
   2. Communication during Bidding Period:
      a. Obtaining documents.
      b. Bidder's Requests for Information.
      c. Bidder's Substitution Request/Prior Approval Request.
      d. Addenda.
   3. Contracting Requirements:
      a. Agreement.
      b. The General Conditions.
      c. The Supplementary Conditions.
      d. Other Owner requirements.
   4. Construction Documents:
      a. Scopes of Work.
      b. Temporary Facilities.
      c. Use of Site.
      d. Work Restrictions.
      e. Alternates, Allowances, and Unit Prices.
      f. Substitutions following award.
   5. Schedule:
      a. Project Schedule.
      b. Contract Time.
      c. Liquidated Damages.
      d. Other Bidder Questions.
   6. Site/facility visit or walkthrough.

E. Minutes: Each attendee will be responsible for taking notes of items discussed in the Pre-Bid meeting. Meeting minutes will not be recorded by Architect nor Owner. Items discussed during the Pre-Bid meeting do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

F. Sign-in Sheet: Pre-Bid meeting sign in sheet will be distributed to attendees and known plan holders.

G. List of Plan Holders: List of known plan holders will be distributed to attendees and known plan holders.

END OF DOCUMENT 00 25 13

DOCUMENT 00 31 19 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

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

B. Limited existing drawings that include information on existing conditions including previous construction at Project site are available for viewing at the office of Owner.

C. Survey information that includes information on existing conditions, prepared by Urban Engineering, dated 4-24-2019 is available for viewing as part of Drawings.

D. Related Requirements:

1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 00 31 19

EXISTING UTILITIES
SECTION 00 31 21

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to work around existing water lines, sewer lines and other utilities. In addition, it shall govern for connecting to the existing water distribution system and the sanitary collection system. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-Definitions.

1.2 LOCATION OF EXISTING UTILITIES

A. The location of existing water lines, sewer lines and other utilities shown on the drawings is based on as-built information from construction drawings, on the ground survey and other information provided by the owners of those facilities. Depiction of the locations on the drawings is intended as a guide to the Contractor but is not guaranteed. Failure to show existing lines and structures will not be considered sufficient basis for claims for additional compensation for extra work, unless the obstruction encountered is such as to necessitate substantial changes in the lines or grades or requires the building of special work for which no provision is made in the drawings and which is not essentially subsidiary to some item of work for which provision is made. The Contractor shall be responsible for locating and protecting all existing utility lines from damage during construction. The Contractor shall notify the appropriate utility company at least 24 hours before beginning any construction. Adjustment of conflicting water lines, sewer lines and other utilities shall be the responsibility of the Contractor. Adjustment of conflicting utility shall be coordinated with the utility affected. When the adjustment is accomplished by the Contractor, it shall be done in the presence of a representative of the utility affected. There shall be no separate payment for adjustment of utilities unless a bid item is provided on the proposal. The Contractor shall be responsible for scheduling the work so that there is no delay in the completion of the entire project. Should the Contractor damage any utility line, the Contractor shall repair said damage (or pay the utility company for repair) to the satisfaction of the utility company at no cost to the Utility Company, the “District” or the Owner.

1.3 WATER DISTRIBUTION AND SANITARY SEWER COLLECTION SYSTEMS

A. General:

The existing water distribution system and sanitary collection system is owned and operated by the City of Port Aransas, which is herein referred to as the City of Port Aransas.

B. Contact:

The City of Port Aransas may be contacted at their office which is located adjacent to the elevated storage tank in Port Aransas. Their telephone is number is 749-5201.

C. Standards, Ordinances And Regulations:

All water distribution system and sanitary sewer collection system improvement shall comply with the standard specifications of the “District”, City Of Port Aransas Ordinances, Texas Department Of Health Regulations and Texas Water Commission Regulations.

D. Notification and Connection to Existing Sanitary Sewer System:

The Contractor shall notify the “District” at least 24 hours prior to excavating within 20 feet of any existing water or sewer line. It shall be the Contractor's responsibility to keep the “District's” Office informed at least once each day of his activities while working within said 20 feet. The actual connection to the existing water or sewer system must be observed by a representative of the City of Port Aransas.

E. Failure to Notify and Inform:

If the Contractor does not notify the City of Port Aransas as stated above and/or does not operate in strict conformance with the contract documents and the existing line is found to be damaged (for any reason) the Contractor shall make repairs to the satisfaction of the City of Port Aransas at no cost to the “District”.

F. Sterilization of Water Lines:

Contractor shall sterilize all water lines in accordance with Texas Department Of Health regulations. Also see Subsection 33 05 05.

G. Testing Of Water And Sewer Lines:

a. Contractor shall test all Water Lines as set out in Subsection 33 05 05.31.
b. Contractor shall test all Sewer Lines as set out in Subsection 33 05 05.1.

1.4 DEVIATIONS OCCASIONED BY EXISTING OBSTRUCTIONS

A. It is assumed, that as elsewhere provided, the Contractor has thoroughly inspected the site, is informed as to the correct location of surface structures, and has included the cost of such incidental work in the price bid, and has considered and allowed for all foreseeable incidental work due to variable sub-surface conditions, whether such conditions and such work are fully and properly described on the drawings or not. Minor changes and variations of the work specified and shown on the drawings shall be expected by the Contractor and allowed for as incidental to the satisfactory completion of a whole and functioning work or improvement.

1.5 TRENCHING AHEAD

A. The Contractor is required to conduct trenching operations in a manner which will allow conflicts to be anticipated thereby allowing measures to be taken in certain cases to circumvent the conflict. Specifically the Contractor shall do the following:

a. Trenching shall be performed a minimum of 100 feet (or the total length of the trench) ahead of pipe laying operations. Pilot Trenches may be used at the Contractor's option.

b. If buried lines are discovered which may cause conflict, Contractor shall stop pipe laying operations and notify Engineer of discovery.

1.6 GRADE/ALIGNMENT OF WATER LINES

A. If a conflict can be avoided by adjusting grades of water lines by maximum of one foot in any direction and no additional fittings are required, no claim for additional compensation for extra work will be considered. Water lines requiring adjustments greater than 1 foot will be considered for extra compensation on an individual basis.

1.7 GRADE/ALIGNMENT OF SANITARY SEWER LINES

A. The grade and/or alignment of sanitary sewer lines shall not be changed unless approved by the Engineer. If the Engineer does allow a grade and/or alignment change extra compensation will be considered on an individual basis provided the change requires an adjustment greater than 1 foot.

1.8 ABANDONED LINES

A. When a line is uncovered that is not in use and is no longer needed, the line shall be cut and plugged. No claim for additional compensation for extra work will be considered for this.

1.9 AVOIDABLE CONFLICTS

A. Conflicts occurring because of the Contractor's failure to trench ahead and which could have been avoided by grade or alignment will not be considered for extra compensation.

1.10 EXTRA WORK

A. No work for which extra compensation is to be received shall be performed until approved by the Engineer and the Owner.

END OF SECTION 00 31 21

• GEOTECHNICAL ENGINEERING
• MATERIALS ENGINEERING & TESTING
• SOILS • ASPHALT • CONCRETE

GEOTECHNICAL SUBSURFACE INVESTIGATION RECOMMENDATIONS FOR THE PROPOSED CITY OF PORT ARANSAS PUBLIC SAFETY BUILDING SIXTH STREET AND AVENUE A PORT ARANSAS, TEXAS

RETL REPORT NUMBER: G119191

PREPARED FOR:

GIGNAC ARCHITECTS
416 STARR
CORPUS CHRISTI, TEXAS 78401

MAY 28, 2019

PREPARED BY:

ROCK ENGINEERING & TESTING LABORATORY, INC.
6817 LEOPARD STREET
CORPUS CHRISTI, TEXAS 78409
P: (361) 883-4555; F: (361) 883-4711
TBPE FIRM NO. 2101

· Geotechnical Engineering
· Construction Materials Engineering & Testing
· Soils · Asphalt · Concrete

May 28, 2019

Gignac Architects
416 Starr
Corpus Christi, Texas 78401

Attention: Mr. Nick Gignac, Associate AIA, LEED AP BD+C

SUBJECT: **SUBSURFACE INVESTIGATION, LABORATORY TESTING PROGRAM AND FOUNDATION AND PAVEMENT RECOMMENDATIONS FOR THE PROPOSED CITY OF PORT ARANSAS PUBLIC SAFETY BUILDING Sixth Street and Avenue A Port Aransas, Texas RETL Job No. – G119191**

Dear Mr. Gignac,

In accordance with our agreement, we have conducted a subsurface investigation, laboratory testing program and foundation and pavement evaluation for the above referenced project. The results of this investigation, together with our recommendations, are to be found in the accompanying report, one electronic copy of which is being transmitted herewith for your records and distribution to the design team.

Often, because of design and construction details that occur on a project, questions arise concerning soil conditions, and Rock Engineering and Testing Laboratory, Inc. (RETL), Texas Professional Engineering Firm No. – 2101, would be pleased to continue its role as Geotechnical Engineer during the project implementation.

RETL also has great interest in providing materials testing and observation services during the construction phase of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience. If you have any questions, or if we can be of further assistance, please contact us at (361) 883-4555.

Sincerely,

Mark C. Rock, P.E.
Vice President of Operations

Rock Engineering & Testing Laboratory, Inc.
www.rocktesting.com

6817 Leopard Street • Corpus Christi, Texas 78409-1703
Office: (361) 883-4555 • Fax: (361) 883-4711

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SUBSURFACE INVESTIGATION, LABORATORY TESTING PROGRAM AND FOUNDATION AND PAVEMENT RECOMMENDATIONS FOR THE PROPOSED CITY OF PORT ARANSAS PUBLIC SAFETY BUILDING SIXTH STREET AND AVENUE A PORT ARANSAS, TEXAS

RETL REPORT NUMBER: G119191

PREPARED FOR:

GIGNAC ARCHITECTS
416 STARR
CORPUS CHRISTI, TEXAS 78401

MAY 28, 2019

PREPARED BY:

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TEXAS PROFESSIONAL ENGINEERING FIRM NO. 2101

J.R. Eichelberger, III, P.E.
Senior Project Engineer
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Vice President of Operations
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INTRODUCTION

This report presents the results of a soils exploration, laboratory testing program and foundation and pavement analysis for the proposed City of Port Aransas Public Safety Building to be constructed at the intersection of Sixth Street and Avenue A in Port Aransas, Texas. This study was conducted for the City of Port Aransas and Gignac Architects.

Authorization

The scope of work for this project was performed in accordance with RETL proposal number P022519A dated February 26, 2019. The proposal was signed by Mr. Nick Gignac, representing Gignac Architects on April 1, 2019 and returned to RETL via e-mail transmission.

Purpose and Scope

The purpose of this exploration was to evaluate the soil and groundwater conditions at the site and to provide foundation and pavement recommendations suitable for the proposed project.

The scope of the exploration and analysis included the subsurface exploration, field and laboratory testing, engineering analysis and evaluation of the subsurface soils, provision of foundation and pavement recommendations and preparation of this report.

The scope of services did not include an environmental assessment. Any statements in this report, or on the boring logs, regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

General

The exploration and analysis of the subsurface conditions reported herein are considered sufficient in detail and scope to provide foundation and pavement recommendations for the proposed project. The information submitted for the proposed project is based on project details provided by Gignac Architects and the soil information obtained at the boring locations. If the designers require additional soil parameters to complete the design of the proposed foundation and pavement and this information can be obtained from the soil data and laboratory tests performed within the scope of work included in our proposal for this project, then RETL will provide the additional information requested as a supplement to this report.

The Geotechnical Engineer states that the findings, recommendations, specifications or professional advice contained herein have been presented after being prepared in a manner consistent with that level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project. RETL operates in general accordance with "*Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction*, (ASTM D3740)." No other representations are expressed or implied, and no warranty or guarantee is included or intended.

This report has been prepared for the exclusive use of Gignac Architects for the specific application to the proposed City of Port Aransas Public Safety Building to be constructed at the intersection of Sixth Street and Avenue A in Port Aransas, Texas.

DESCRIPTION OF SITE

The site of the proposed project is located at the intersection of Sixth Street and Avenue A in Port Aransas, Texas. The site is relatively open and level. The surface of the site at the boring locations was primarily covered with existing pavements with the exception at borings B-4, B-6, and B-10 where the surface consisted of grass. The pavement encountered consisted generally of hot mix asphaltic concrete overlaid on concrete. Overhead utilities and evidence of underground utilities were observed at the site. At the time of our field investigation, the condition of the ground surface was firm did not pose any significant difficulties to the drill crew moving their equipment.

FIELD EXPLORATION

Scope

The field exploration, to evaluate the engineering characteristics of the subsurface materials, included reconnaissance of the project site, performing the boring operations and obtaining disturbed split spoon samples. During the sample recovery operations the soils encountered were classified and recorded on the boring logs in accordance with "*Standard Guide for Field Logging of Subsurface Exploration of Soil and Rock*, (ASTM D5434)."

Ten borings were performed at this site for the purpose of providing geotechnical information. The table below provides the boring identification, boring depth and GPS coordinates at the boring locations:

SUMMARY OF BORING INFORMATION		
Boring Identification	**Boring Depth (ft)**	**GPS Coordinates**
B-1	35	N 27.83545° W 97.06830°
B-2	35	N 27.83561° W 97.06831°
B-3	35	N 27.83564° W 97.06849°
B-4	35	N 27.83563° W 97.06865°
B-5	35	N 27.83572° W 97.06858°
B-6	15	N 27.83565° W 97.06793°
B-7	15	N 27.83592° W 97.06850°
B-8	15	N 27.83546° W 97.06896°
B-9	15	N 27.83532° W 97.06869°
B-10	15	N 27.83484° W 97.06783°

The GPS coordinates, obtained at the boring locations using a Garmin model Etrex Venture GPS, are provided in this report and on the boring logs. The owner/architect determined the scope of the field work. RETL staked the boring locations, and performed the drilling operations. Upon completion of the drilling operations and obtaining the groundwater observations, the drill holes were backfilled with excavated soil and the site cleaned as required. A boring location plan is provided in the Appendix.

The borings performed for this project were used to determine the classification and strengths of the subgrade soils. This information is provided on the boring logs and includes boring locations, boring depth, soil classification, field tests and laboratory test results. The boring logs are included in the Appendix.

Drilling and Sampling Procedures

The test borings were performed using a drilling rig equipped with a rotary head turning hollow stem augers to advance the boreholes. Disturbed soil samples were obtained using split-barrel sampling procedures in general accordance with the procedures for, "*Penetration Test and Split-Barrel Sampling of Soils,* (ASTM D1586)."

All of the samples were classified, placed in plastic bags, marked according to boring number, depth and any other pertinent field data, stored in special containers and delivered to the laboratory for testing.

Field Tests and Observations

Standard Penetration Tests – During the sampling procedures, standard penetration tests (SPT) were performed to obtain the standard penetration value of the soil at selected intervals. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling 30-inches, required to advance the split-barrel sampler 1-foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three successive 6-inch penetrations. The "N" value is obtained by adding the second and third 6-inch increment number of blows. An automatic hammer was utilized while performing the STP. An automatic hammer is typically taken to have an efficiency of one. The results of standard penetration tests indicate the relative density of cohesionless soils and comparative consistency of cohesive soils, thereby providing a basis for estimating the relative strength and compressibility of the soil profile components.

Water Level Observations – Water level observations were obtained during the test boring operations. Water level observations are noted on the boring logs provided in the Appendix. In relatively pervious soils, such as sandy soils, the indicated depths are usually reliable groundwater levels. In relatively impervious soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, proximity to a creek, river or lake and recent rainfall conditions may influence the depth to the groundwater. The amount of water in open boreholes largely depends on the permeability of the soils encountered at the boring locations.

Ground Surface Elevations – The ground surface elevations at the boring locations were not provided. Therefore, all depths referred to in this report are measured from the ground surface at the boring locations during the time of our field investigation unless specified otherwise.

LABORATORY TESTING PROGRAM

In addition to the field investigation, a laboratory testing program was conducted to determine additional pertinent engineering characteristics of the subsurface materials necessary in analyzing the behavior of the foundation and pavement systems for the proposed project.

The laboratory testing program included supplementary visual classification (ASTM D2487) and water content tests (ASTM D2216) on all samples. In addition, selected samples were subjected to Atterberg limits tests (ASTM D4318) and percent material finer than the #200 sieve tests (ASTM D1140).

All phases of the laboratory testing program were conducted in general accordance with applicable ASTM Specifications. The results of these tests are to be found on the accompanying boring logs provided in the Appendix.

SUBSURFACE CONDITIONS

General

The types of foundation and pavement bearing materials encountered in the test borings have been visually classified and are described in detail on the boring logs. The results of the standard penetration tests, water level observations and other laboratory tests are presented on the boring logs in numerical form. Representative samples of the soils were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of three months after issuance of this report.

The stratification of the soil, as shown on the boring logs, represents the soil conditions at the actual boring locations. Variations may occur between, or beyond, the boring locations. Lines of demarcation represent the approximate boundary between different soil types, but the transition may be gradual, or not clearly defined.

It should be noted that, whereas the test borings were drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean soil fill.

Soil Conditions

The soil conditions encountered in test borings performed at the project site have been summarized and soil properties including soil classification, plasticity, strength, angle of internal friction, effective unit weight, percent passing the No. 200 sieve and range of SPT results results are provided in the following table:

Soil Profile Table

D	Generalized Soil Description	LL	PI	C	ϕ	γ_e	-#200	N
0-2	Poorly Graded **SAND** with Silt	---	---	0	29	110	2-7	5-13
2-19	Poorly Graded **SAND,** Silty **SAND** & Clayey **SAND**	NP	NP	0	28	50	2-28	WOH-14
19-31	Poorly Graded **SAND &** Silty **SAND**	---	---	0	31	55	---	12-41
31-35	Poorly Graded **SAND**	---	---	0	28	50	---	3-8

Where:

D = Depth in feet below existing grade
LL = Liquid limit (%)
PI = Plasticity index
C = Soil Cohesion, psf (undrained)
ϕ = Angle of Internal Friction, deg. (undrained)
γ_e = Effective soil unit weight, pcf
-#200 = Percent of soils passing the #200 sieve
N = Standard Penetration Test (blows per foot)
NP = Non Plastic
WOH = Weight of Hammer

It should be noted that pavement was encountered at boring locations B-1, B-2, B-3, B-5, B-7, B-8, and B-9. In addition, an exception to the soils generalized in the table above exists. Of particular interest a stratum of CLAYEY Sand encountered in boring B-4 between the depths of 17 to 22-feet. The standard penetration test was WOH. The liquid limit was 61 percent and the plasticity index was 42. The percent of silt and clay particles determined by the minus number 200 sieve was 34 percent.

Variations to the generalized soil profile table above were observed. Detailed descriptions of the soils encountered at the boring locations are provided on the boring logs included in the Appendix.

Seismic Site Class

As stated on Page 205, Chapter 20, "SITE CLASSIFICATION PROCEDURE FOR SEISMIC DESIGN" of ASCE/SEI 7-05, "Where the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless authority having jurisdiction or geotechnical data determines Site Class E or F soil are present at the site." Since our field investigations have not included a 100-foot deep boring, by definition the soil properties are not known in sufficient detail. Additionally, Table 20.3-1-Site Classification provides that the soil undrained shear strength for Site Class E soils should have a Standard Penetration Resistance of less than 15, and an undrained shear strength less than 1000 psf. These soils are present in the upper 23-feet at this site. Therefore, the seismic site class in accordance with the ASCE/SEI 7-05 should be assumed to be Site Class E.

Groundwater Observations

Groundwater (GW) observations and the depths the borings caved are provided in the following table:

GROUNDWATER (GW) OBSERVATIONS		
BORING NO.	**DURING DRILLING**	**UPON COMPLETION**
B-1	2'	GW at 1.5' and Caved at 2'
B-2	2'	GW at 1.5' and Caved at 2'
B-3	1.5'	Wet and Caved at 1.5'
B-4	4'	GW at 1.5' and Caved at 2'
B-5	4'	GW at 1.5' and Caved at 2'
B-6	2'	Wet and Caved at 2'
B-7	2.5'	GW at 1.5' and Caved at 2'
B-8	3'	Wet and Caved at 1.5'
B-9	2'	GW at 1.5' and Caved at 2'
B-10	1.5'	GW at 1.25' and Caved at 1.5'

Based on observations made in the field and moisture contents obtained in the laboratory, it appears as if the average depth at which groundwater will be encountered at this site is near the 1.5 to 2-foot depth at the time of our field investigation.

Groundwater near the ground surface occurs in the vicinity of this project particularly after significant rainfall events where stormwater runoff fills in the air voids in the surficial sand soils. High groundwater conditions can continue until the groundwater has an opportunity to drain to the bay. RETL encourages the contractor to verify the depth to groundwater prior to bidding to account for the need to dewater excavations for utilities, foundations, etc. at this site. Problems with high water levels in non-cohesive soil regimes can be exacerbated by the contractor's activities particularly when using vibratory effort during compaction operations. The contractor should be aware of the high water table and encouraged to utilize construction means and methods to minimize construction activities that can draw water up or cause the non-cohesive soils from going "quick". If any soft areas are identified, the soils should be removed and recompacted in place.

It should be noted that water levels in open boreholes may require several hours to several days to stabilize depending on the permeability of the soils and that groundwater levels at this site may be subject to seasonal conditions, recent rainfall, and drought or temperature effects.

FOUNDATION DISCUSSION

Project Description

Based on the information provided to RETL, the proposed City of Port Aransas Public Safety Building is to be constructed at the intersection of Sixth Street and Avenue A in Port Aransas, Texas.

The project will include the construction of a new Public Safety Building. The proposed structure will have an elevated single occupied story and have an approximate footprint of 18,000 square feet. The first level floor slab of the proposed structure will be structurally suspended at a minimum height of 9-feet above the existing grade. The grade supported concrete will be designed similar to a rigid concrete pavement and will be isolated from the building foundation system. Additionally, this project will include parking areas and access drives.

RETL has not been provided information regarding whether or not the site is located within a FEMA VE-Zone. It is our understanding that structures located within a FEMA VE-Zone are required to be supported on deep foundations founded at least 20-feet below grade. Recommendations for deep cast in place drilled piers and driven concrete pile foundations are provided in this report.

Potential Vertical Rise (PVR) Discussion

The laboratory test results indicate that the subsoils in the active zone at this site are non-plastic. **Based on the results of the field and laboratory testing, the site can be considered as non-expansive based on the soil conditions at the time of the field exploration.** The PVR was calculated using the Texas Department of Transportation Method TEX-124E and took into account the depth of the active zone, estimated to extend to a depth of approximately 2-feet. The expansive potential of the soils at this site are considered to be negligible and are not a controlling factor in the design at this site.

FOUNDATION TYPES CONSIDERED

Drilled Piers – Conventional cast in place straight shaft drilled piers and auger cast in place piles were considered for use at this site. Due to the absence of a competent clay layer necessary to seal temporary steel casing, the slurry displacement method of pier installation will be required for conventional straight shaft drilled piers. Augered cast in place piles will not require temporary steel casing or the slurry displacement method for installation. Augered cast in place piles are an acceptable foundation system provided additional scrutiny during installation is provided.

Driven Piles – Concrete driven piles are being considered as a deep foundation system to support the proposed Public Safety Building. Driven piles may result in vibrations felt in other nearby structures making their use undesirable. Pile driving operations shall commence and continue until the desired pile tip elevation is achieved. Any heave experienced once the piles have been driven to grade will require that those piles that experience heave are re-driven to the desired pile tip elevation. Proper hammer sizing and proper pile driving protocol is required when driving concrete piles to assure that proper pile capacities are achieved and that the piles maintain their integrity. Proper pile driving protocol and capacity determination can be accomplished by utilizing dynamic pile driving analysis (PDA) and CAPWAP analysis.

FOUNDATION RECOMMENDATIONS

Drilled Piers

Recommendations provided herein are applicable to both cast in place straight shaft drilled piers and augered cast-in-place piles except when specifically addressed such as in the **CONSTRUCTION CONSIDERATIONS** where **Augered Cast-in-Place Piles** are specifically addressed. The structural designer can utilize the allowable unit skin friction values for the range in depths included in the following table for straight shaft drilled piers and augered cast-in-place piles to resist the axial loads given the strengths of the subsurface soils encountered:

ALLOWABLE UNIT SKIN FRICTION VALUES	
Depth Below Existing Grade (ft)	**Allowable Unit Skin Friction (psf)**
0-5	Neglect
5-19	100
19-31	575

All depths are referenced from the existing ground surface elevations at the boring locations during the time of our field investigation.

The allowable unit skin friction values provided above are based on the strengths of the in-situ soils and utilize a safety factor of 2.0 to prevent shear failure. The minimum depth of a straight shaft drilled pier based on the soil conditions encountered is 20-feet and the maximum termination depth for straight shaft drilled piers is 31-feet. Resistance to uplift from transient loads can be calculated by taking 60-percent of the axial capacity of a straight shaft drilled pier. The floor slab utilized with drilled piers will be a structural floor slab approximately 9-feet above existing grade.

Settlement of a properly designed and constructed straight shaft drilled pier can be expected to experience settlement on the order of 1-percent of the shaft diameter of the pier and differential settlements of equally loaded same size drilled shafts should experience differential settlements on the order of 0.5-percent of the pier shaft diameters.

Straight shaft drilled piers should be spaced no closer than three pier diameters apart measured center to center. Drilled piers at this site should be adequately reinforced with a minimum of 1 percent of the cross-sectional area of the pier shaft throughout the depth of the pier to withstand uplift forces.

Pile Foundations

Deep driven concrete piles can be utilized at this site to support the proposed structures. The structural designer can utilize the allowable unit skin friction values for compressive loads and the allowable unit end bearing values provided for the range in depths included in the following table to resist the axial loads given the strengths of the subsurface soils encountered:

ALLOWABLE UNIT SKIN FRICTION VALUES AND END BEARING VALUES			
Depth (ft)	**Allow. Compressive Unit Skin Friction (psf) DRIVEN**	**Allow. Compressive Unit Skin Friction (psf) JETTED**	**Allowable Unit End Bearing (psf)**
0-5	Neglect	Neglect	---
5-19	125	100	---
19-31	300	Not Applicable	19’ to 25’; 9,250 25’ to 31’; 7,800

The allowable unit skin friction values provided above are based on the strengths of the in-situ soils and utilize a design safety factor of approximately 2 for skin friction and approximately 3 for end bearing. The values in the JETTED column allow for jetting the piles to the 19-foot depth. Between the depths of 19-feet and extending to the recommended maximum pile termination depth, piles shall be continuously driven. Resistance to uplift can be calculated by taking 60-percent of the skin friction component of axial capacity of a driven pile plus the weight of the pile. The minimum pile depth is 20 feet and the maximum pile depth is 31-feet.

Settlement of an individual pile will be on the order of 1-inch, or less, and between equally loaded piles settlement on the order of ½-inch, or less, can be expected. It is recommended that the pile foundations be founded at approximately the same depth and are loaded similarly to minimize differential settlement.

The pile foundations shall be spaced a minimum of 3-times the diameter of the largest adjacent pile apart measured center to center. If groups of piles are required to support concentrated loads, an appropriate modification of the estimated bearing capacity must be made on the basis of the group efficiency factor.

The floor slab utilized with driven piles will be a structural floor slab approximately 9-feet above existing grade.

The supporting capacity of a group of vertically loaded piles can be considerably less than the sum of capacities of the individual members comprising the group. The capacity of the group varies as a function of change in size, spacing and stiffness. Axial group capacity may be estimated from the following:

$$P = E * N * Q$$

Where E is the group efficiency, N is the number of piles in the group and Q is the single pile capacity. Values of group efficiency (E) increase from about 0.8 at a pile spacing of 2.5 to about 1.0 at a spacing of 5 pile diameters. Detailed analyses of pile-soil interaction for a specific group spacing would be necessary to define actual efficiency.

Piles could heave during the driving process as a result of being driven adjacent to one another. It is recommended that if piles heave during the driving of an adjacent pile, the heaved piles should be re-driven to their initial depth as soon as possible.

Lateral Pile Analysis

Lateral pile analysis programs such as L-pile will require the following soil parameters for this site:

LATERAL PILE ANALYSIS PARAMETERS

D	Description	C	ϕ	γ_e	K_s	E_{50}
0-5	Poorly Graded **SAND,** Silty **SAND** & Clayey **SAND**	Neglect				
5-19	Poorly Graded **SAND,** Silty **SAND** & Clayey **SAND**	0	28	50	20	---
19-31	Poorly Graded **SAND &** Silty **SAND**	0	31	55	60	---

Where: D = depth (ft)
γ_e = effective unit weight, pcf
C = shear strength, psf (undrained)
ϕ= angle of internal friction, deg.
K_s = modulus of subgrade reaction (pci)
E_{50} = 50% strain value

K_s and E_{50} values were estimated from known correlations.

PAVEMENT CONSIDERATIONS

In designing the proposed parking areas and driveways, the existing subgrade conditions must be considered together with the expected traffic use and loading conditions.

The conditions that influence pavement design can be summarized as follows:

- Bearing values of the subgrade. These can be represented by a California Bearing Ratio (CBR) for the design of flexible pavements, or a Modulus of Subgrade Reaction (K) for rigid pavements.

- Vehicular traffic, in terms of the number and frequency of vehicles and their range of axle loads.

- Probable increase in vehicular use over the life of the pavement.

- The availability of suitable materials to be used in the construction of the pavement and their relative costs.

Specific laboratory testing to define the subgrade strength (i.e. CBR/K values) have not been performed for this analysis. **Based upon local experience, the estimated CBR and K values for the natural surficial poorly graded sand soils encountered at this site is, 10 and 200 pci, respectively.**

Since traffic counts and design vehicles have not been provided, it is only possible to provide a non-engineered pavement section suitable for light and heavy duty service based on pavement sections, which have provided adequate serviceability for similar type facilities.

Parking areas and drives can be designed with either a flexible or rigid pavement.

The recommended light and heavy duty flexible pavement sections, using locally available materials, are provided in the following tables:

Light Duty Flexible Pavement (Passenger Cars & Parking)	
Hot Mix Asphaltic Concrete	2"
Crushed Limestone Base Material (TxDOT Item 247 Type A; Gr. 1-2)	6"
Tensar Geogrid TX5	Yes
Compacted Poorly Graded Sand Subgrade	12"

Heavy Duty Flexible Pavement (Driveways and Services Areas)	
Hot Mix Asphaltic Concrete	2½"
Crushed Limestone Base Material (TxDOT Item 247 Type A; Gr. 1-2)	8"
Tensar Geogrid TX5	Yes
Compacted Poorly Graded Sand Subgrade	12"

It is important that any existing organic and compressible soils be removed and the exposed subgrade be properly prepared prior to pavement installation.

Once all organics and other deleterious materials have been removed the exposed subgrade soils shall be compacted to a minimum density of 95% of the maximum dry unit weight of the raw subgrade soils as determined by a standard Proctor test (ASTM D698) and at, or above, the optimum moisture content.

A single layer of TENSAR TX5 geogrid shall be placed in accordance with the manufacturer's recommendations on top of properly prepared subgrade soils.

Base materials in flexible pavement areas should meet the requirements set forth in Texas Standard Specifications 2014; Item 247, Type A, Grade 1-2 and should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of 98% of the maximum dry density as determined by the modified Proctor test (ASTM D 1557) and within ± 1.5 percentage points of the optimum moisture content.

Hot mix asphaltic concrete should meet the requirements set forth in Texas Standard Specifications 2014 Item 340; Type D, or C, surface course.

Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavements allow for quick deterioration of the pavement primarily due to saturation of the underlying base materials and subgrade soils.

The use of concrete for paving has become more prevalent in recent years due to a decrease in the material cost of concrete and to the long term maintenance cost benefits of concrete pavement compared to asphaltic pavements. The recommended light and heavy-duty rigid pavement sections are provided in the following table:

Rigid Pavement	**Light**	**Heavy**
Reinforced Concrete	6"	7"
Compacted Poorly Graded Sand Subgrade	12"	12"

Concrete pavement is recommended in areas that receive continuous repetitive traffic such as loading/unloading areas, drive-thru lanes and driveway entrances.

The concrete pavement should be properly reinforced and jointed, as per ACI, and should have a minimum 28-day compressive strength of 4,000 psi. Expansion joints should be sealed with an appropriate sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized. The joints should be thoroughly cleaned and sealant should be installed without overfilling before pavement is opened to traffic.

Concrete pavement at least 8-inches thick is recommended for the trash dump approach areas due to the high wheel and impact loads that these areas receive. The concrete pads at the location of the trash dumpsters should be large enough to accommodate both the front and rear wheels of the vehicles used to pick up the trash dumpsters. Maintenance or operations managers need to stress the importance of placing the trash dumpsters in their proper locations to reduce the distress trash pickup operations place on the pavement.

During the lifespan of the roadways and parking areas, routine maintenance such as crack sealing and seal coats for flexible pavements, and joint maintenance for rigid pavement sections will be required. Without proper maintenance, moisture infiltration into the base material and subgrade will result in rapid deterioration of the pavement system. RETL recommends that the owner and/or maintenance manager protect their investment by incorporating an aggressive maintenance program.

SITE IMPROVEMENT METHODS

Concrete Flatwork Construction Considerations

Provisions in the site development should be made in order to maintain relatively uniform moisture contents of the supporting soils. A number of measures may be used to attain a reduction in subsoil moisture content variations. Some of these measures are outlined below:

- During construction, positive drainage schemes should be implemented to prevent ponding of water on the subgrade.

- Positive drainage should be maintained around the structures and flatwork through roof/gutter systems connected to piping or directed to paved surfaces, transmitting water away from the foundation perimeters and flatwork. In addition, positive grades sloping away from the foundations and flatwork should be designed and implemented. We recommend that an effective site drainage plan be devised by others prior to commencement of construction to provide positive drainage away from the site improvements and off the site, both during, and after construction.

- Vegetation placed in landscape beds that are adjacent to the structure and flatwork should be limited to plants and shrubs that will not exceed a mature height of 3-feet. Large bushes and trees should be planted away from the slab foundations and flatwork at a distance that will exceed their full mature height and canopy width.

- Individual concrete panels of concrete sitework should be dowelled together to minimize trip hazards as a result of differential movements within the flatwork.

- Pavements should be designed to drain quickly with a minimum positive slope of 1-percent.

All project features beyond the scope of those discussed above should be planned and designed similarly to attain a region of relatively uniform moisture content within the foundation and flatwork areas. Poor drainage schemes are generally the primary cause of foundation and flatwork problems in South Texas.

CONSTRUCTION CONSIDERATIONS

Drilled, Cast-in-Place, Pier Construction Considerations

For deep drilled pier construction at this site, the slurry displaced method of excavating drilled piers will be necessary to prevent groundwater and soils from infiltrating into the pier excavation. Observations made in the field indicate that groundwater is at the approximate depth of approximately 2-feet. The temporary steel casing might be considered to start the pier excavation when using the slurry displacement method of pier installation. It may be more economical for the drilled pier contractor to utilize a combination of casing and slurry displacement method to excavate the straight shaft drilled pier

The slurry displacement method of performing the pier excavation is applicable for any situation requiring casing. It is required if it is not possible to get an adequate water seal with the casing to keep groundwater out of the shaft cavity. Note that it is essential in this method that there is a sufficient slurry head available (or that the slurry density can be increased as needed) so the inside pressure is greater than that from the groundwater table or the tendency of the soil to cave.

Bentonite is most commonly used with water to produce the slurry (“bentonite slurry”). Some experimentation may be required to obtain optimum percentage for a site but amounts in the range of 4 to 6 percent by weight are usually adequate.

The bentonite should be well mixed with water so that the mixture is not lumpy. The slurry should be capable of forming a filter cake on the shaft wall and to carry the smaller (say, under 6mm) excavated particles in suspension.

With the slurry method it is generally desirable to:

- Prevent having the slurry in the shaft too long to prevent an excessively thick filter cake is difficult to displace with concrete during shaft filling.

- Pump the slurry and screen out the larger soil particles in suspension then the “conditioned” slurry can be returned to the shaft prior to concreting.

- Care should be exercised in excavating clay through the slurry so that pulling a large fragment does not cause sufficient negative pore pressure, or suction, to develop and collapse a part of the shaft.

When the shaft is complete the reinforcing steel cage is set in place and a tremie installed (this sequence is usually necessary so that the tremie does not have to be pulled to set the cage and then reinserted-almost certain to produce a slurry film discontinuity in the shaft). Concrete is pumped with great care taken that the tremie is always well submerged in the concrete so a minimum surface area is exposed and contaminated with slurry. Studies have shown that the concrete will adequately displace slurry particles from the reinforcing steel cage so a good bond can be obtained, and as previously noted, if the shaft is not open too long the filter cake on the pier wall is reasonably displaced as well.

Care must be taken during concrete placement and casing removal to ensure that sufficient concrete head is maintained inside the casing to prevent soil intrusions in the pier concrete. Concrete should be placed as soon as possible after all loose material has been removed, the pier excavation inspected and reinforcing steel installed. A relatively high slump concrete mix (6 to 7 inches) is recommended. The soils engineer should be present to witness the test pier excavation. The pier excavation should not be allowed to stay open overnight.

The successful placement of a pier foundation is dependent on the expertise of the drilled pier foundation contractor. The Geotechnical Engineer, or his designated representative, should be present to witness the pier excavation.

Augered Cast-in-Place Piles

The successful augered cast-in-place pile installations will depend upon the expertise of the contractor and the techniques used. Whereas this installation can be monitored to determine that the piles are installed in general accordance with the specification, it is not possible to make an absolute determination of the capacities of each individual pile. Therefore, the contractor should be required to guarantee or certify this work and provide sufficient references for similar type projects.

Because of the possibility of soil intrusions during auger withdrawal and nonvertical or “dog-leg” piles, the job specifications must be carefully prepared and a continuous inspection of the installation maintained during installation to monitor depths and the amount of concrete pumped versus the rate of auger withdrawal.

If these piles will be subject to uplift due to wind load, etc., they must be provided with adequate reinforcing steel throughout their length. A single piece of reinforcing steel can usually be installed the complete depth of an auger cast-in-place pile. A cage system of reinforcing steel can usually be installed after completion of the pile and generally can be pushed to a depth of 10 to 15 feet.

Typical specifications require a minimum of 10-feet of grout head be pumped above the tip of the auger when at the desired termination depth prior to starting the auger withdrawal. The withdrawal rate of the auger and grout pumping operations shall achieve a minimum of 115-percent of the theoretical volume of the pile for each 5-foot increment of pile until grout return is observed at the ground surface at which point the minimum of 100-percent of the theoretical volume shall be pumped.

Concern over the percentage of defective piles warrants extraordinary efforts during construction to achieve sound piles with the desired physical dimensions to support the proposed loads. RETL recommends that PIR-A and pump stroke counter be utilized during construction. PIR-A will provide real time grout factor verses depth to the pile installation contractor so that deficiencies can be addressed prior to completion of the pile. The pump stroke counter shall be reset after each pile installation. In addition RETL recommends that a minimum of 25-percent of the piles be subjected to PIT testing upon completion of the pile installation program. Once finished installing a pile and prior to moving and setting up on the next pile location, the pile contractor shall provide the PIR-A printout summary of the drilling operations, which provides the grout factor for each 5-foot increment to the Geotechnical Engineer, or his designated representative, to verify conformance to the project specifications. If the depth or grout factor does not meet the project specifications then corrective actions are required while the grout is still plastic. Provisions for the contractor to address pile deficiencies shall be approved the project Structural Engineer.

Driven Pile Installation Considerations

Driving of piles may result in undesirable vibrations affecting existing equipment and heaving of adjacent soils during pile driving operations. Pile driving operations should be performed continuously due to the tendency of sand soils to freeze the pile if driving operations are interrupted.

The contractor shall perform a Wave Equation Analysis of Pile Drive (WEAP) for the type of hammer that will be utilized on this project. The WEAP shall be required by the project specifications to be approved and sealed by the contractor's geotechnical engineer and shall be provided to the project engineer as a submittal. The hammer type modeled using the WEAP analysis shall be utilized by the contractor during all pile driving operations.

The initial pile driven at the site shall be instrumented using Pile Driving Analyzer (PDA) during driving and driven with the hammer modeled for the WEAP provided. In addition to the data obtained during driving, a minimum 24-hour set check shall be performed after the initial driving in order to estimate the probable capacity by the use of PDA and CAPWAP. A result of the PDA and CAPWAP shall be used to establish a pile driving protocol and the contractor shall install the piles using the protocol developed.

If jetting is utilized to install the piles, over-jetting should be avoided. Over-jetting may reduce the allowable capacity of the installed piles.

Piles designed to resist lateral loads should be driven until the desired termination depth of the driven pile is achieved. Allowances for pile modification should be made in the contract to allow for field changes based on pile driving criteria.

The Geotechnical Engineer, or his designated representative, should be present during pile installations.

Site Preparation

In the area where the first level concrete pavement is to be constructed in conjunction with a driven pile foundation system, soil, vegetation and all loose or excessively organic materials shall be removed to a minimum depth of 6-inches below the ground surface. The excavation should extend a minimum distance of 5-feet outside the perimeter of the proposed structure and any appurtenances (including porches, attached sidewalks, stoops, etc.). The upper 1-foot of exposed subgrade soil shall be compacted to a minimum density of 95-percent of the maximum dry density as determined by the standard Proctor test (ASTM D698) and at, or above, the optimum moisture content. If any soft areas are identified, the soils should be removed and recompacted in place.

Upon completion of the subgrade preparations, a minimum of 6-inches of properly compacted select fill soils shall be placed in the excavation in order to achieve the desired finished concrete pavement elevation. Select fill shall be placed in such a manner to provide a uniform select fill pad thickness supporting the proposed concrete pavement. It is recommended that the concrete pavement have a minimum thickness of 5½ inches.

Select Fill

Imported select fill material used at this site shall be homogenous, free from organics, and clay balls, and other deleterious materials and shall have a maximum liquid limit of 40-percent and a plasticity index (PI) between 7 and 18. The select fill soils shall have a minimum of 35-percent passing the #200 sieve and no soil particles exceeding 1½-inches will be permitted. The fill shall be placed in no greater than 8-inch thick loose lifts and compacted to a minimum density of 95-percent of the maximum dry density, as determined by the standard Proctor (ASTM D698), and at, or above, the optimum moisture content.

Clean sand free from organics and other deleterious materials similar to the natural in-situ poorly graded sand soils may be utilized at this site as "**Select Fill**" with the understanding that grade beams may collapse warranting extra effort by the contractor to clean the loose soils from grade beams prior to placement of foundation concrete and that overruns on concrete may occur.

Earthwork and Foundation Acceptance

Exposure to the environment may weaken the soils at the foundation and pavement bearing levels if excavations remain open for long periods of time. Therefore, it is recommended that excavations be extended to final grade and the foundations and pavements be constructed as soon as possible to minimize potential damage to the bearing soils. The foundation and pavement bearing levels should be free of loose soil, ponded water or debris, and should be observed prior to concreting by the Geotechnical Engineer, or his designated representative.

Foundation concrete and pavement constituents should not be placed on soils that have been disturbed by rainfall or seepage. If the bearing soils are softened by surface water intrusion, or by desiccation, the unsuitable soils must be removed and be replaced with properly compacted soils or base material as directed by the Geotechnical Engineer.

The Geotechnical Engineer, or his designated representative, should monitor subgrade preparation. As a guideline, density tests should be performed on the exposed subgrade soils and each subsequent lift of compacted select fill soils at a rate of one test per 2,000-square feet or a minimum of three in-place nuclear tests per testing interval, whichever is greater. Any areas not meeting the required compaction should be recompacted and retested until compliance is met.

Vapor Retarder

A vapor retarder, with a permeance of less than 0.3 US perms (ASTM E96), should be placed under any grade supported concrete pavement slab on the subgrade to reduce the transmission of water vapor from the supporting soil through the concrete slab and to function as a slip sheet to reduce subgrade drag friction. Polyethylene film, or polyolefin, with a minimum thickness of 10 mils (0.25 mm) is typically used for reduced vapor transmission and durability during and after its installation. The vapor retarder should be installed according to *"Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slab, (ASTM E1643)."*

All penetrations through the vapor retarder should be sealed to ensure its integrity. The vapor retarder should be taped around all openings to ensure the effectiveness of the barrier. Grade stakes should not be driven through the barrier and care should be taken to avoid punctures during reinforcement and concrete placement. Placement of slab concrete directly on the vapor retarder increases the risks of surface dusting, blistering and slab curling making good concrete practice critical. A low water to cement ratio concrete mix design, combined with proper and adequate curing procedures, will help ensure a good quality slab.

Where vapor transmission is not a concern, elimination of the vapor retarder may provide improvements in finishing characteristics and reductions in the risks of surface dusting, blistering and slab curling. However, exposure of portions of the subgrade or granular layer such as at blockouts for columns or utility penetrations, to inclement weather during construction, may create excessive or deficient moisture conditions beneath portions of the slab that have already been placed. Blockouts for slab penetrations should be protected if a vapor retarder is omitted. ACI 302.1R-96, *"Guide for Concrete Floor and Slab Construction,"* recommends that a vapor retarder or vapor barrier be used only when required by the specific application.

Dewatering

Based on the groundwater observations made during the drilling operations and based on our experience with other geotechnical investigations performed in the vicinity, it appears that dewatering will be required for excavations deeper than approximately 1 ½ to 2-feet. It should be noted that the depth to the groundwater is subject to change due to climatic and site conditions, therefore, it should be made the responsibility of the contractor to verify depths to groundwater. **A unit cost price for dewatering should be included in the contract documents.**

Subsurface water that flows in an upward direction into an excavation area that is being dewatered imparts a seepage force that tends to loosen the soil, reducing the soil strength. The change in strength should be considered in designing excavation bracing and foundations. Where excavations are to extend more than a few feet below groundwater level, open ditches or pits may not be practical, and more advanced methods may be required.

Utilities

Utilities that project through a concrete pavement slab or walls should be designed with either some degree of flexibility, or with sleeves, in order to prevent damage to these lines should vertical movement occur.

Expansion Joints

Expansion joints should be designed and placed in various portions of the proposed structure. Properly planned placement of these joints will assist in controlling the degree and location of material cracking that normally occurs due to material shrinkage, thermal affects, soil movements and other related structural conditions.

GENERAL COMMENTS

If significant changes are made in the character or location of the proposed project, a consultation should be arranged to review any changes with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

It is recommended that the services of RETL be engaged to test and evaluate the soils in the foundation and pavement excavations prior to concreting or placing pavement constituents in order to verify that the bearing soils are consistent with those encountered in the borings. RETL cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundation or pavements if not engaged to also provide construction observation and testing for this project. If it is required for RETL to accept any liability, then RETL must agree with the plans and perform such observation during construction as we recommend.

All sheeting, shoring, and bracing of trenches, pits and excavations should be made the responsibility of the contractor and should comply with all current and applicable local, state and federal safety codes, regulations and practices, including the Occupational Safety and Health Administration.

APPENDIX

• Geotechnical Engineering
• Construction Materials Engineering & Testing
• Soils • Asphalt • Concrete

BORING LOCATION PLAN

May 28, 2019
Attn.: Mr. Nick Gignac, AIA
RETL Job No.: G119191

CITY OF PORT ARANSAS PUBLIC SAFETY BUILDING
Sixth Street and Avenue A
Port Aransas, Texas

Rock Engineering & Testing Laboratory, Inc.
www.rocktesting.com

6817 Leopard Street • Corpus Christi, Texas 78409-1703
Office: (361) 883-4555 • Fax: (361) 883-4711

10856 Vandale St. • San Antonio, Texas 78216-3625
Office: (210) 495-8000 • Fax: (210) 495-8015

No.1 Roundville Lane • Round Rock, Texas 78664
Office: (512) 284-8022 • Fax: (512) 284-7764

LOG OF BORING B-1

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/7/19 - 5/7/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 2-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT LL	ATTERBERG LIMITS: PLASTIC LIMIT PL	ATTERBERG LIMITS: PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 1.5-inches.
												CONCRETE, approximately 4.25-inches.
		SS S-1		N= 7	26							**POORLY GRADED SAND**, moist, brown, loose.
		SS S-2		N= 2	25						2	Same as above, very loose.
	5	SS S-3		N= 7	25							Same as above, loose.
		SS S-4		N= 1	27							**POORLY GRADED SAND**, moist, gray, very loose.
	10	SS S-5		N= WOH	27							Same as above, gray.
		SS S-6		N= WOH	42	NP	NP	NP			28	**SILTY SAND**, moist, gray, very loose (SM).
	15											
		SS S-7		N= 13	27							**POORLY GRADED SAND**, moist, gray, medium.
	20											
		SS S-8		N= 15	25							Same as above.
	25											
		SS S-9		N= 12	23							Same as above.
	30											
		SS S-10		N= 6	23							**POORLY GRADED SAND**, moist, gray, loose.
	35											Boring was terminated at a depth of 35-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83545, W 97.06830.

LOG_OF_BORING 119191 PORT A PUBLIC SAFETY BLDG_NJ_5-17.GPJ ROCK_ETL.GDT 5/24/19

LOG OF BORING B-2

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/7/19 - 5/7/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 2-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 2-inches.
												CEMENT STABILIZED SAND, approximately 2-inches.
		SS S-1		N= 11	24							**POORLY GRADED SAND**, moist, brown, medium.
		SS S-2		N= 4	25							Same as above, very loose.
	5	SS S-3		N= 14	22							Same as above, gray, medium.
		SS S-4		N= 1	25						4	**POORLY GRADED SAND**, moist, gray, very loose.
	10	SS S-5		N= 1	25							Same as above.
		SS S-6		N= 3	30							Same as above.
	15											
		SS S-7		N= 13	29							**POORLY GRADED SAND**, moist, gray, medium.
	20											
		SS S-8		N= 41	26							Same as above, dense.
	25											
		SS S-9		N= 8	23							Same as above, loose.
	30											
		SS S-10		N= 3	25							**POORLY GRADED SAND**, moist, gray, very loose.
	35											Boring terminated at a depth of 35-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83561, W 97.06831.

LOG OF BORING B-3

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/7/19 - 5/7/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 1.5-feet during drilling.
Wet and Caved at 1.5-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 1.75-inches.
												CONCRETE, approximately 3.25-inches.
		SS S-1		N= 11	24							**POORLY GRADED SAND**, moist, brown, medium.
		SS S-2		N= 1	26						2	Same as above, very loose.
	5	SS S-3		N= 7	22							Same as above, loose.
		SS S-4		N= 2	26							**POORLY GRADED SAND**, moist, gray, very loose.
	10	SS S-5		N= WOH	26						2	Same as above.
		SS S-6		N= WOH	30							Same as above.
	15											
		SS S-7		N= 5	27							**POORLY GRADED SAND**, moist, gray, loose.
	20											
		SS S-8		N= 21	23							Same as above, medium.
	25											
		SS S-9		N= 12	23							Same as above, medium.
	30											
		SS S-10		N= 5	23							**POORLY GRADED SAND**, moist, gray, loose.
	35											Boring terminated at a depth of 35-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83564, W 97.06849.

LOG OF BORING B-4

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/7/19 - 5/7/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 4-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SS S-1		N= 13	23							**POORLY GRADED SAND**, moist, brown, medium.
	5	SS S-2		N= 5	26							Same as above, loose.
		SS S-3		N= 5	27							Same as above, gray.
		SS S-4		N= 2	26						17	**SILTY SAND**, moist, gray, very loose.
	10	SS S-5		N= 4	28							Same as above.
		SS S-6		N= 2	31							Same as above.
	15											
	20	SS S-7		N= WOH	49	61	19	42			34	**CLAYEY SAND**, wet, gray, very soft (SC).
		SS S-8		N= 16	26							**POORLY GRADED SAND**, moist, gray, medium.
	25											
		SS S-9		N= 16	22							Same as above.
	30											
		SS S-10		N= 3	24							Same as above, very loose.
	35											Boring was terminated at a depth of 35-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83563, W 97.06865.

LOG OF BORING B-5

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/7/19 - 5/7/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 4-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 1.5-inches.
												CONCRETE, approximately 3.5-inches.
		SS S-1		N= 12	25							**POORLY GRADED SAND**, moist, brown, medium.
		SS S-2		N= 8	27						3	Same as above, loose.
	5	SS S-3		N= 8	24							Same as above, gray.
		SS S-4		N= 6	26							**POORLY GRADED SAND**, moist, gray, loose.
	10	SS S-5		N= 1	28							Same as above, very loose.
		SS S-6		N= 2	30	NP	NP	NP			4	Same as above (SP).
	15											
		SS S-7		N= 12	32							**POORLY GRADED SAND**, moist, gray, medium.
	20											
		SS S-8		N= 24	23							Same as above.
	25											
		SS S-9		N= 13	25							Same as above.
	30											
		SS S-10		N= 5	23							**POORLY GRADED SAND**, moist, gray, loose.
	35											Boring was terminated at a depth of 35-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83572, W 97.06858.

LOG OF BORING B-6

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/9/19 - 5/9/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 2-feet during drilling.
Wet and Caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SS S-1		N= 5	24							**POORLY GRADED SAND**, moist, brown, loose.
	5	SS S-2		N= 4	28							Same as above, very loose.
		SS S-3		N= 2	27							Same as above, gray.
	10	SS S-4		N= 1	30						8	**POORLY GRADED SAND WITH SILT**, moist, gray, very loose.
		SS S-5		N= WOH	30							Same as above.
	15	SS S-6		N= 2	33							Same as above.
												Boring was terminated at a depth of 15-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83565, W 97.06793.

LOG OF BORING B-7

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/9/19 - 5/9/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 2.5-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 1.5-inches.
												CEMENT STABILIZED SAND, approximately 3.5-inches.
		SS S-1		N= 10	22						2	**POORLY GRADED SAND**, moist, brown, medium.
		SS S-2		N= 4	27							Same as above, very loose.
	5	SS S-3		N= 9	31							Same as above, gray, loose.
		SS S-4		N= 2	24							**POORLY GRADED SAND**, moist, gray, very loose.
	10	SS S-5		N= 4	26							Same as above.
		SS S-6		N= 1	25						3	Same as above.
	15											Boring was terminated at a depth of 15-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83592, W 97.06850.

LOG OF BORING B-8

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/9/19 - 5/9/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 3-feet during drilling.
GW at 1.5-feet upon completion.

SURFACE ELEVATION: N/A

FIELD DATA					LABORATORY DATA							
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SS S-1		N= 8	29							**ASPHALT,** approximately 1.75-inches.
												CONCRETE, approximately 3.25-inches.
												POORLY GRADED SAND, moist, brown, loose.
		SS S-2		N= 6	27							Same as above.
	5											
		SS S-3		N= 2	27						5	**POORLY GRADED SAND WITH SILT**, moist, gray, very loose.
		SS S-4		N= 2	27							Same as above.
	10											
		SS S-5		N= WOH	27							Same as above.
		SS S-6		N= 3	28							**POORLY GRADED SAND WITH SILT**, moist, gray, very loose.
	15											Boring was terminated at a depth of 15-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83546, W 97.06896.

LOG OF BORING B-9

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/8/19 - 5/8/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 2-feet during drilling.
GW at 1.5-feet and caved at 2-feet upon completion.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT, approximately 1.5-inches.
												CONCRETE, approximately 5-inches.
		SS S-1		N= 10	23						7	**POORLY GRADED SAND WITH SILT**, moist, brown, loose.
		SS S-2		N= 3	29							Same as above very loose.
	5	SS S-3		N= 10	24							Same as above, gray, loose.
		SS S-4		N= 2	27							**POORLY GRADED SAND WITH SILT**, moist, gray, very loose.
	10	SS S-5		N= WOH	27							Same as above.
		SS S-6		N= 2	33							Same as above.
	15											Boring was terminated at a depth of 15-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83532, W 97.06869.

LOG OF BORING B-10

Rock Engineering & Testing Labratory Inc.
6817 Leopard Street
Corpus Christi, TX
Telephone: 3618834555
Fax: 3618834711

CLIENT: Gignac Architects
PROJECT: Port Aransas Public Safety Building Project
LOCATION: Sixth Street (Harper Dr) and Avenue A
NUMBER: G119191
DATE(S) DRILLED: 5/9/19 - 5/9/19

DRILLING METHOD(S):
Hollow Stem Auger

GROUNDWATER INFORMATION:
Groundwater (GW) was encountered at a depth of 1.5-feet during drilling.
GW at 1.25-feet and caved at 1.5-feet upon completion.

SURFACE ELEVATION: N/A

FIELD DATA					LABORATORY DATA							
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SS S-1		N= 10	28						6	**POORLY GRADED SAND WITH SILT**, moist, brown, loose.
	5	SS S-2		N= 4	25							Same as above, very loose.
		SS S-3		N= 1	30							Same as above, gray.
		SS S-4		N= 1	28						4	**POORLY GRADED SAND**, moist, gray, very loose.
	10	SS S-5		N= 5	30							Same as above, loose.
		SS S-6		N= WOH	34							**CLAYEY SAND**, wet, gray, very soft.
	15											Boring was terminated at a depth of 15-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location and depth were determined by Owner/Architect. Drilling operations were performed by RETL at GPS Coordinates N 27.83484, W 97.06783.

Engineering & Testing
Laboratory, Inc.

Rock Engineering & Testing Laboratory
6817 Leopard Street
Corpus Christi, TX 78409-1703
Telephone: 361-883-4555
Fax: 361-883-4711

KEY TO SOIL CLASSIFICATION AND SYMBOLS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well Graded Gravels or Gravel-Sand mixtures, little or no fines
		GP	Poorly Graded Gravels or Gravel-Sand mixtures, little or no fines
		GM	Silty Gravels, Gravel-Sand-Silt mixtures
		GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SAND AND SANDY SOILS	SW	Well Graded Sands or Gravelly Sands, little or no fines
		SP	Poorly Graded Sands or Gravelly Sands, little or no fines
		SM	Silty Sands, Sand-Silt Mixtures
		SC	Clayey Sands, Sand-Clay mixtures
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML	Inorganic Silts and very fine Sands, Rock Flour, Silty or Clayey fine Sands or Clayey Silts
		CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		OL	Organic Silts and Organic Silt-Clays of low plasticity
	SILTS AND CLAYS LL > 50	MH	Inorganic Silts, Micaceous or Diatomaceous fine Sandy or Silty soils, Elastic Silts
		CH	Inorganic Clays of high plasticity, Fat Clays
		OH	Organic Clays of medium to high plasticity, Organic Silts
HIGHLY ORGANIC SOILS		PT	Peat and other Highly Organic soils

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance

FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical

LAMINATED (VARVED) - composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top

CRUMBLY - cohesive soils which break into small blocks or crumbs on drying

CALCAREOUS - containing appreciable quantities of calcium carbonate, generally nodular

WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes

POORLY GRADED - predominantly of one grain size uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded)

SYMBOLS FOR TEST DATA

- — Groundwater Level (Initial Reading)
- — Groundwater Level (Final Reading)
- — Shelby Tube Sample
- — SPT Samples
- — Auger Sample
- — Rock Core

TERMS DESCRIBING CONSISTENCY OF SOIL

COARSE GRAINED SOILS		FINE GRAINED SOILS		
DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.
Very Loose	0 - 4	Very Soft	< 2	< 0.25
Loose	4 - 10	Soft	2 - 4	0.25 - 0.50
Medium	10 - 30	Firm	4 - 8	0.50 - 1.00
Dense	30 - 50	Stiff	8 - 15	1.00 - 2.00
Very Dense	over 50	Very Stiff	15 - 30	2.00 - 4.00
		Hard	over 30	over 4.00

Field Classification for "Consistency" is determined with a 0.25" diameter penetrometer

SECTION 00 31 43 - PERMIT APPLICATION

PART 1 - Permit Application

1.1 PERMIT APPLICATION INFORMATION

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

B. Permit Application: Complete building permit application and file with authorities having jurisdiction within five days of the Notice of Award.

1. Contractor shall be responsible for all fees associated with the building permit.

END OF SECTION 00 31 43

DOCUMENT 00 41 13 - BID FORM - SINGLE-PRIME CONTRACT

1.1 BID INFORMATION

A. Bidder: _____.

B. Date & Time: June 22, 2023, at 2:00 p.m. CST

C. Project Name: Public Safety Center – City of Port Aransas.

D. Project Location: 705 W Avenue A, Port Aransas, TX 78373.

E. Owner: City of Port Aransas.

F. Architect: Gignac & Associates, LLP.

G. Architect Project Number: 18.22

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Gignac Architects and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars ($_____).

1.3 ALLOWANCES

A. The undersigned Bidder certifies that Base Bid submission includes those allowances described in the Contract Documents and scheduled in Section 012100 "Allowances."

1.4 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____ Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

C. Bidders agrees that the Owner has the right to accept or reject any or all bids and to waive all informalities.

D. The contractor acknowledges the prevailing wage rates for this county and agrees to provide actual wage rates to be paid upon award of the contract.

1.5 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work within _____ calendar days including anticipated inclement weather days and muddy ground conditions days.

B. To work ____ working days per week.

C. To start work ____ days after notice of award of contract.

1.6 EXTRA WORK:

D. The undersigned agrees that should any change in the work or extra work be ordered, the allowance for overhead and profit combined shall be as scheduled below, but in no case shall it exceed 8%. The following applicable percentages shall be added to the extra work cost as defined by Article 12 of the General Conditions.

E. Allowance to the Contractor for overhead and profit for extra work provided by his own forces: 4%%

F. Allowance to the Contractor for overhead and Profit for extra work provided by a subcontractor and supervised by the Contractor: 4%.

G. The General Contractor shall not be allowed to charge the Owner for "extended overhead" changes relating to Change of Orders or anticipated weather delays.

1.7 ACKNOWLEDGEMENT OF ADDENDA

H. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated _____.
2. Addendum No. 2, dated _____.
3. Addendum No. 3, dated _____.
4. Addendum No. 4, dated _____.

1.6 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form.

1. Bid Form Supplement – Schedule of Values.

2. Bid Form Supplement - Bid Bond Form (AIA Document A310).

AIA Document A310, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

1.7 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in the State of Texas, Nueces County, City of Kingsville and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

B. The Bidder attests and affirms that he and his subcontractors are skilled and experienced in the use and interpretation of plans, specifications, addenda and related proposal documents and, that he has carefully reviewed the plans, specifications, addenda and related proposal documents for this project and has found them to be free of conflicts and/or ambiguities and sufficient for bid and construction purposes. Further, he has carefully examined the soils reports and the site of the work, and, through his own personal observations, has satisfied himself as to the nature, location and requirements of the work; the character, quality and quantity of materials required; the difficulties likely to be encountered; the other items and/or conditions which may affect the satisfactory performance of the work. He has based his bid solely on these documents, and personal observations, and has not relied in any way on any explanation or interpretation, oral or written, from any source other than those written and issued by the Architect/Engineer.

1.8 SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 2023.

B. Submitted By :_____(Name of bidding firm or corporation).

C. Authorized Signature :_____(handwritten signature).

D. Signed By :_____(Type or print name).

E. Title :_____(Owner/Partner/President/Vice President).

END OF DOCUMENT 00 41 13

DOCUMENT 00 43 13 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

B. Each Bid must be accompanied by a Bid Security in the amount of 5% of the largest possible total of the Bid submitted.

C. The Bid Security may be by cash, certified check, or a Bid Bond. The Bid Bond must be executed by the Bidder as principal. The Bid Bond form and security company are subject to approval by the Owner and the Surety must comply with requirements noted in Article 11 of the Supplementary General Conditions.

D. The Bid Security will be returned to all except the three lowest Bidders within three days after opening of the Bids.

E. The remaining Bid Securities will be returned promptly after the Owner and the accepted Bidder have executed the contract, or, if no award has been made within thirty days after the date of the opening of Bids, upon demand of the Bidder anytime thereafter so long as he has not been notified of the acceptance of his bid.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; www.aia.org/contractdocs/purchase/index.htm; email: docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 004313

DOCUMENT 00 43 73 - PROPOSED SCHEDULE OF VALUES FORM

1.1 BID FORM SUPPLEMENT

A. A completed Proposed Schedule of Values form is required to be attached to the Bid Form.

1.2 PROPOSED SCHEDULE OF VALUES FORM

A. Proposed Schedule of Values Form: Provide a breakdown of the bid amount, including alternates, in enough detail to facilitate continued evaluation of bid. Coordinate with the Project Manual table of contents. Provide multiple line items for principal material and subcontract amounts in excess of 5 percent of the Contract Sum.

B. Arrange schedule of values consistent with format of AIA Document G703.

1. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 00 43 73

SECTION 00 50 00 - AGREEMENT FORM

AGREEMENT

The Agreement shall be executed on AIA Document Number A101- 2017 Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum. A sample of this form is available for viewing in the owner's office.

END OF SECTION 00 50 00

SECTION 00 60 00 - BONDS AND CERTIFICATES

The Contractor shall furnish the following Bonds and Certificates to be delivered simultaneously with the executed contract:

A. Performance Bond

B. Labor and Materials Payment Bond

C. Certificates of Insurance - provide on AIA Documents G- or approved format.

The Performance, Labor and Materials bond shall be provided on Bonds which comply with Article 5160 of the Revised Civil Statutes of the State of Texas as amended by Acts of the 64th Legislature 1975 and Acts of the 65th Legislature, 1977.

The Surety on such bonds shall be a surety company satisfactory to the Owner. See Article 11 of the supplementary condition.

Costs of the above stated bonds and insurance are to be included in the bid.

Attorneys-in-Fact who sign bonds must file with each bond a certified and effective dated copy of their Power of Attorney.

The Performance Bond shall guarantee the repair and maintenance of all defects due to faulty materials and workmanship that appear within one (1) year from date of substantial completion.

END OF SECTION 00 60 00

SECTION 00 70 00 - GENERAL CONDITIONS

The General Conditions of the Contract are set forth in the American Institute of Architects Document A201, 2017 entitled "General Conditions of the Contract for Construction", Fifteenth Edition, containing Articles 1 through 15 as edited and contained herein shall hereby be made part of the Contract Documents.

The General Conditions shall become a part of this Contract and shall apply to the Contractor and all Subcontractors.

END OF SECTION 00 70 00

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Public Safety Center
705 W. Avenue A, Port Aransas, TX 78373.

THE OWNER:
(Name, legal status and address)

City of Port Aransas
710 W. Avenue A
Port Aransas, TX 78373

THE ARCHITECT:
(Name, legal status and address)

Gignac & Associates, Limited Liability Partnership
416 Starr St.
Corpus Christi, Texas 78401

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (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 or proposal 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. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 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.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 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 retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and 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 the 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 suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, 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 suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 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.

§ 2.3.2 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.

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

§ 2.3.4 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.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.4 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.

§ 2.5 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 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 default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for 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. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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 its 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 2.3.4, 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 submit 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, subject to Section 15.1.7, 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. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative 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 approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 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

§ 3.5.1 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.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 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 14 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 that an equitable adjustment be made 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, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the 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 notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice 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 and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably 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, or fails to provide submittals in accordance with the approved 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 make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and 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 how 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 the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect 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 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.

§ 3.12.10.1 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 be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately 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 and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 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, 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, or patching shall be restored to the condition existing prior to the cutting, fitting, or 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 construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its 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 and 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 the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work
The Contractor shall provide the Owner and Architect with 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 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 an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the 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 Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract
§ 4.2.1 The Architect will provide administration of the Contract as described in the 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.

§ 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 promptly report to the Owner (1) known deviations from the

Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) 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

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 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 13.4.2 and 13.4.3, whether or not the 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, 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 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 order 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 Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 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 the 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, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice 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 for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract 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; 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 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 term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 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 any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its 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 or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has 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 notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work 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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 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 that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor 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. The Contractor shall proceed promptly with changes in the Work, 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 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine 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 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.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, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 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.

§ 7.3.7 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.

§ 7.3.8 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 may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will

affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended 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

§ 9.1.1 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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and

unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent 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. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and 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 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, suppliers, or other persons or entities that 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 (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole 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 in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. 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. 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 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 suppliers 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 either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 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 supplier 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 Contractor shall reflect such payment on its next Application 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 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 and suppliers 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 or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to 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 or provided by 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, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 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' 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 shutdown, 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; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and 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 the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the 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 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 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. 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 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, (3) a written statement that the Contractor knows of no 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, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and 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, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, 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, corrected, 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 the 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;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a 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, a Subcontractor, or a Sub-subcontractor; 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 implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

§ 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. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is 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, notice of the 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 and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. 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 notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's 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 the material or substance or who are to perform the task of removal or safe containment of the 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 by the amount of the Contractor's reasonable additional costs of shutdown, 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 hazardous 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 hazardous 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 reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances 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 reimburse 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 Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 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.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, 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 those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 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, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement 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 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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, the Contractor shall be entitled to an equitable adjustment to

the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before 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 any 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 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 2.5.

§ 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 of the Owner or Separate Contractors, whether completed or partially completed, 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, excluding that jurisdiction's choice of law rules. 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 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 the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 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.

§ 13.3.2 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 thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 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 tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 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 13.4.1, 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 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 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.

§ 13.4.4 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.

§ 13.4.5 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.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties 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.

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, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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 reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work 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' 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 or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.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 reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner 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' 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 under 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 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 Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, 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. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the 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 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by 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 under this Section 15.1.3.1 shall 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.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 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.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 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.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of 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 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, 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. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a 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 the 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 receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, 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 15.1.7, 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 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 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. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 those of the Owner and Contractor under this Agreement.

Additions and Deletions Report for

AIA® Document A201® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 02:57:18 ET on 05/19/2023.

PAGE 1

Public Safety Center
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...

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Raymond Gignac, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 02:57:18 ET on 05/19/2023 under Order No. 4104240199 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ - 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

007300 - SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following supplements modify the "General Conditions of the Contract for Construction", AIA Document A201, Sixteenth Edition, 2017. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect. As appropriate, for purposes of this Request for Proposal, the term "Bid" shall mean "Proposal" and the term "Bidder" shall mean "Offeror", wherever they appear in the Construction Documents.

ARTICLE 1 -- GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENT

Delete Section **1.1.1** in its entirety and substitute the following:

1.1.1 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), Performance Bond, Labor and Material Payment Bond, 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 propose, instructions to Proposers, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's Proposal or portions of Addenda relating to proposal requirements).

To the extent any provision in the Supplementary Conditions to these AIA Document A201-2017 General Conditions, issued by Owner, conflicts with any provision in the Supplementary Conditions issued by the Architect; the Supplementary Conditions to these AIA Document A201-2017 General Conditions issued by Owner shall control.

1.1.3 THE WORK

Add the following sentence at the end of this section:

It also includes all supplies, skill, supervision, transportation services and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the contract and all other items of cost or value needed to produce, construct and fully complete the work identified by the Contract Documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Sections:

1.2.1.2 Precedence of the Contract Documents: The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

.1 Contract Modifications (such as Change Orders) signed by the Contractor and Owner.

.2 The Agreement. (AIA Document A101-2017)

.3 The Supplementary Conditions

.4 The General Conditions of the Contract for Construction

.**5** Addenda, with those of later date having precedence over those of earlier date

.6 Drawings and Specifications

Should these Documents disagree in themselves, the Architect and Owner will select the appropriate method for performing the Work, to facilitating avoiding increase in the Contract cost.

1.2.1.3 Relation of Specifications and Drawings: To be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the most expensive combination of quality and quantity of Work indicated. In the event of the above mentioned disagreements, the resolution shall be determined by the Architect and Owner.

1.6 NOTICE

Delete the text of Section **1.6.1** in its entirety and substitute the following:

1.6.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer at the corporation for which is was intended, or if delivered at or sent by certified mail, or by registered or certified mail, or by courier service providing proof of delivery, to the last business address known to the party giving notice, or if delivered by facsimile or other electronic communications to the offices of the person or corporation for which it was intended. For facsimiles or other electronic communications received after 5:00 p.m. on a business day, or on a weekend or legal holiday on which the recipient's offices are closed, notice shall be deemed to have been duly served on the next business day.

Delete the text of Section **1.6.2** in its entirety.

Add Section **1.9** as follows:

1.9 MISCELLANEOUS OTHER DEFINITIONS

1.9.1 ADDENDA, ADDENDUM

Documents issued by the Architect prior to execution of the Owner Contractor Agreement for this Project that modify or clarify the Proposal Documents. All addenda become a part of the Contract Documents.

1.9.2 ALTERNATE PROPOSAL(S)

A separate amount stated on a separate Proposal Form which, if accepted by the Owner, will be added to or deducted from the Base Proposal. If accepted, the work that corresponds to the alternate proposal will become part of the agreement between Owner and Contractor. Alternate proposals shall remain valid for the same period of time as the Base Proposal after receipt of proposals, regardless if an Owner Contractor Agreement has been executed, unless indicated otherwise herein.

1.9.3 APPROVED, APPROVED EQUIVALENT, APPROVED EQUAL, OR EQUAL

The terms Approved, Approved Equivalent, Approved Equal, and Or Equal, relate to the substitution of products or systems approved in writing by the Architect. Refer to Paragraph 3.4.2, Substitution of Products and Systems, for procedures which must be followed after award of contract. The substitution procedure process to be followed prior to receipt of proposals is described in the Instructions to Bidders.

1.9.4 BASE PROPOSAL

The Contractor's proposal for the Work, not including any Alternates.

1.9.5 CONTRACT TIME

The period of time including Anticipated Weather Days which is established in the Contract Documents for Substantial Completion of the Work. This period of time is subject to authorized adjustments for Unanticipated Weather Days and other Calendar Day extensions of time as enumerated in the Contract Documents.

1.9.6 DATE OF AGREEMENT

The date the Owner formally awards a Contract for Construction of the Work. This date will be inserted in the first page of the Agreement between Owner and Contractor and shall be referenced in Performance Bond and Payment Bond forms. See also Date of Commencement of Work.

1.9.7 DATE OF COMMENCEMENT OF THE WORK

The date of a written Notice to Proceed to the Contractor for a given portion of the Work. This date constitutes day zero (0) of the stated Contract Time. The Notice to Proceed will be issued after the Owner has received and validated the Contractor's Payment Bond, Performance Bond and Insurance.

1.9.8 DATE OF FINAL COMPLETION

The end of construction. See AIA Document A201, Section 9.10.

1.9.9 DAY

The following days are referenced in the documents:

.1 Calendar Days. Extensions of time granted for Regular Work Days lost, if any, will be converted to Calendar Days.

.2 Holidays: The days officially recognized by the construction industry in this area as a holiday; normally limited to the observance days of New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and the day after and Christmas Day.

.3 Regular Work Days: All calendar days except holidays, Saturdays, and Sundays. Requests for extensions of time shall be requested on the basis of Regular Work Days, and those days, if approved, will be converted to calendar days by multiplying by a factor of one and four-tenths (1.4).

.4 Anticipated Weather Days: An allowance of Regular Work Days, established as probable days lost due to weather delays; said allowance to be included in the Contractor's proposed Completion Time on his Bid Form.

.5 Weather Days: Regular Work Days when rain, flooding, snow, unusually high winds, excessively wet grounds, or similar circumstances prevent progress on major or critical portions of the Work. The Contractor will be entitled to an extension of the Contract Time for the net additional time, if any, which result from deducting the amount of Anticipated Weather Days from the total amount of Weather Days.

.6 Net Weather Days: The difference in working days between Anticipated Weather Days and Weather Days.

1.9.10 NOTICE TO PROCEED

A notice that may be given by the Owner to the Contractor that directs the Contractor to start the Work. It may also establish the Date of Commencement of the Work.

1.9.11 PROVIDE

Whenever the word "provide" is used in these documents, it shall mean the same as "furnish and install".

1.9.12 PUNCH LIST

A comprehensive list prepared by the Contractor prior to Substantial Completion to establish all items to be completed or corrected; this list may be supplemented by the Architect or Owner. See AIA Document A201, Section 9.8.

1.9.13 UNIT PRICES

A cost for a unit of work as described in the Contract Documents. The Owner may add or deduct Unit Price work at the amounts stated on the Proposal Form and such amounts shall not be subject to additional mark up by the Contractor or his subcontractors."

ARTICLE 2 – OWNER

2.1 GENERAL

Delete the text of Section **2.1.1** in its entirety and substitute the following:

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. All parties understand that only the Board of Trustees for the Owner acting as a body corporate has the authority to bind the Owner with respect to all matters requiring the Board's approval under current policy of the Board of Trustees for the Owner, including, but not limited to, Change Orders. Except as otherwise provided in Section 4.2.1, the Architect does not have authority to bind the Owner with respect to matters requiring the Owner's approval or authorization. The term "Owner" means the Owner or the Owner's authorized representative.

Delete the text of Section **2.1.2** in its entirely.

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

After the first sentence of Section **2.2.1,** delete the remainder of Section **2.2.1** in its entirety.

Delete Sections **2.2.2** and **2.2.3** in their entirety.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Delete Section **2.3.6** in its entirety and replace it with the following:

2.3.6 The Contractor will be furnished free of charge 25 copies of the Drawings and 25 copies of the Project Manual. These copies may have been used during the Bid/Proposal process and it is the

Contractor's responsibility to determine their completeness and to request replacement of any missing portions. Additional new copies will be furnished at the cost of reproduction, postage, and handling.

2.5 OWNER'S RIGHT TO CARRY OUT THE WORK

Delete the text of Section **2.5.** in its entirety and substitute the following:

If the Contractor defaults or neglects to carry out the work in accordance with the Contract Documents and fails, 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 actual cost of correcting such deficiencies, including the Owner's expenses and compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to the 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 within thirty (30) days of receipt of written notice from the Owner therefor.

Add Section **2.6** as follows:

2.6 OWNER'S LACK OF LIABILITY TO THIRD PARTY

2.6.1 The Owner is not responsible for the acts and/or omissions of, or contractually involved with, any subcontractors, suppliers of labor or materials, and/or their respective employees or agents or any other third-party claimants. Such claimants shall not constitute third party beneficiaries under this contract. The Contractor and/or his Surety solely shall deal with, take responsibility for, and be liable to such parties under this Contract. Contractor will indemnify and defend the Owner from any legal actions against Owner for unpaid bills of subcontractors.

Add Section **2.7** as follows:

2.7 OWNER'S RIGHT TO OCCUPY THE PROJECT

2.7.1 The Owner shall have the right to occupy or use without prejudice to the right of either party, any

completed or largely completed portions of the project, notwithstanding the time for completing the entire work or such portions may not yet have expired. Such occupancy and use shall not constitute acceptance of any work not in accordance with the Contract Documents. If the Contractor determines that said occupancy may cause a delay to the completion of the project, he shall notify the Owner in writing immediately.

2.7.2 Refer to Article 11 Insurance and Bonds regarding property insurance requirements in the event of such occupancy.

2.7.3 If Contractor has not completed the obligations of the Contract Documents by the dates established by subsequent Amendments to the Agreement Between Owner and Construction Manager, the Owner shall have the right to occupy or use the entire project.

ARTICLE 3 -- CONTRACTOR

3.1 GENERAL

Add Section **3.1.4** as follows:

3.1.4 The Contractor must be fully qualified under any state or local licensing laws for Contractors in effect at the time and at the location of the work. The Contractor is responsible for determining that all of his subcontractors and prospective subcontractors are duly licensed in accordance with the law.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Delete the last sentence of Section **3.2.4** in its entirety and substitute the following:

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 provided such errors, inconsistencies, omissions, differences, or nonconformities could not have been ascertained from a careful study of the Contract Documents.

Add Sections **3.2.5, 3.2.**6 and **3.2.7** as follows:

3.2.5 The Contractor shall make a reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation. The Contractor shall not ask the Architect for observation of work prior to the Contractor's field superintendent's personal inspection of the work and his determination that the work of all major subcontractors in complete.

3.2.6 If, in the opinion of the Architect, the Contractor does not make a reasonable effort to comply with the above requirements of the Contract Documents and this causes the Architect or his Consultants to expend an unreasonable amount of time in the discharge of the duties imposed on him by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure. The Architect will give the Contractor prior notice of intent to bill for additional services related to Sections 3.2.5, 3.2.6 and 3.7 before additional services are performed.

3.2.7 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor his Warranty, he shall promptly notify the Architect in writing, providing substantiation for his position. Any necessary changes, including substitutions of materials, shall be accomplished by appropriate Modification.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Delete the last sentence of Section **3.3.1** in its entirety and substitute the following:

If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures, but only to the extent the Owner would be responsible for any such losses or damages under state and/or federal law.

Add Sections **3.3.4** and **3.3.5** as follows:

3.3.4 The Contractor is especially cautioned to coordinate the routing of mechanical and electrical items prior to commencing these operations.

3.3.5 Any time that the Contractors' 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 are on site, the work shall be supervised by a qualified employee of the Contractor.

3.4 LABOR AND MATERIALS

Delete Section **3.4.2** in its entirety and replace it with the following:

3.4.2 The materials, products, and the systems covered by these specifications have been selected as a standard because of quality, particular suitability, or record of satisfactory performance. It is not intended to preclude the use of equivalent or better materials, products, or systems provided that same meets the requirements of the particular project and have been approved in an addendum as a substitution prior to the submission of bids. If prior written approval in an addendum has not been obtained, it will be assumed that the Bid is based upon the materials, products, and systems described in the Bidding Documents and no substitutions will be permitted, except as provided hereinafter.

- **.1** If, after award of contract, the Contractor of one of his Subcontractors, or Suppliers determines that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor the Warranty, the Contractor shall promptly notify the Architect, in writing, providing detailed substantiation for his position. Any changes deemed necessary by the Owner and Architect, including substitution of materials and change in Contract Sum, either upward or downward, if any, shall be accompanied by appropriate Modification.
- **.2** After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products on the Work in place of those specified only under the conditions set forth in specification referring to Product Options and Substitutions.
- **.3** Requests for substitution, received by the Architect later than forty five (45) days after "Notice to Proceed" or "Date of Commencement of the Work" (whichever occurs first), may result in additional costs to the Owner. Contractor agrees to reimburse the Owner through deductive Change Order to the Contract, for all costs associated with such requests.
- **.4** By making request for substitutions based on Subparagraph 3.4.2 above, the Contractor

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equivalent or superior in all respects to that specified, and is suitable for the intended purpose;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

.5 Substitution requests shall be submitted on the forms included herein and in accordance with the process established in specification referring to Product Options and Substitutions.

3.5 WARRANTY

Delete the text of Section 3.5.1 in its entirety and substitute the following:

3.5.1 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 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 cause by abuse, material alteration to the Work not executed by the Contractor, insufficient maintenance or maintenance not in compliance with written instructions therefor, operation not in compliance with written instructions therefor, 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.

Add Sections **3.5.3, 3.5.4** and **3.5.5** as follows:

3.5.3 In the event of failure in the Work, including a specified product, whether during construction, or the correction period (which shall be one (1) year from the Date of Substantial Completion, except where a longer period as specified), the Contractor shall take prompt and appropriate measures to assure correction or replacement of the defective Work or any portion thereof, including manufactured products, whether notified by the Owner or the Architect. Upon correction of warranty items, the Contractor shall provide the Owner and Architect with written notification of said correction. This obligation shall survive acceptance of the Work under the Construction Contract.

3.5.4 The Contractual Correction Period for this Project is one (1) year from the date of Substantial Completion, except for any extended warranties as specified within the Contract Documents. Items of Work not completed until after the deadline for Substantial Completions shall have their warranties (general and any extended warranty periods) extended by the period of time between the deadline for Substantial Completion and the actual completion of the Work. Such warranties shall be submitted to the Owner in writing, documenting such time extensions. This correction period shall not restrict or modify extended warranties called for or provided on systems, equipment or other specific portions of the Work.

3.5.5 The Contractor shall accompany the Owner and Architect for a complete reinspection of the Project approximately eleven (11) months after the Date of Substantial Completion and shall promptly complete any observed or reported deficiencies in the Work, including any uncompleted Punch List items or outstanding and incomplete warranty items. The contractor shall provide written notification to the Owner and Architect when said Punch List items and/or additional deficiencies observed have been corrected. This obligation shall survive acceptance of the Work under the Construction Contract.

3.6 TAXES

Delete Section **3.6** in its entirety and substitute the following:

The Owner may qualifies for exemption from certain State and Local Sales and Use Taxes. Failure by the Contractor or Subcontractors to take advantage of the Owner's exemption and to obtain such exemption certificate shall make him responsible for paying taxes incurred on materials furnished on the Project without additional cost to or reimbursement by the Owner.

3.7 PERMITS, FEES, NOTICES AND COMPLIANCES WITH LAWS

After Section **3.7.1**, add the following Sections:

3.7.1 .1 The Owner shall pay directly to the governing authority the cost of all permanent property utility assessments and similar utility connection charges.

.2 The Contractor shall pay directly all temporary utility charges (excluding permanent power), utility district/company inspection fees, temporary tap charges, and temporary water meter charges and any other similar fees assessed by jurisdictional authority having control over this Project. The Contractor shall secure and pay for all governing authorities' permit fees.

.3 Fees payable to the Texas Department of Licensing and Regulation (TDLR) for document review relative to the Elimination of Architectural Barriers Act shall be paid by the Owner and the Architect will submit the documents to the TDLR for review and approval.

.4 The Contractor shall pay all SWPPP related costs.

3.8 ALLOWANCES

Delete Section **3.8** in its entirety and substitute the following:

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 and approve in writing.

3.9 SUPERINTENDENT

Delete Section 3.9.1 in its entirety and substitute the following:

3.9.1 The Contractor shall employ a competent superintendent, project manager and necessary assistants who shall be in attendance at the Project site during performance of the Work, including Punch List work. The superintendent and project manager shall represent the Contractor, and unless provided otherwise in Section 3.1.1, communications given to the superintendent or project manager shall be binding as if given to the Contractor.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES

Delete Section **3.10.1** and substitute the following:

3.10.1 Within 30 days of being awarded an Amendment, the Contractor shall prepare and submit for the Owner and Architect's review, a construction schedule for the Work, with critical path clearly defined. The schedule shall not exceed time limits current under the Contract Documents. For further schedule requirements refer to specification section regarding project schedules in the Project Manual.

Add Section **3.10.4** as follows:

3.10.4 The Contractor shall submit to the Architect, with each monthly Application for Payment; a copy of the progress schedule updated to reflect the current status of the project. The Contractor shall take whatever action necessary to assure that the project completion schedule is met.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add Section **3.11.1** as follows:

3.11.1 The Contractor shall post all Addenda on Construction Documents prior to commencing work in the site.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

At Section **3.12.5**, add the following Sections:

3.12.5 .1 If, in the opinion of the Architect, the Shop Drawings, Product Data, Samples and similar submittals are incomplete, indicate an inadequate understanding of the work covered by the submittals, or indicate a lack of study and review by the Contractor prior to submittal to the Architect, the submittals will be returned, unchecked, to the Contractor for correction of these three deficiencies and subsequent resubmittal. Additional service charges as outlined in 3.2.6 may be charged by the Architect in this event.

.2 The Architect will take no action on Shop Drawings, Product Data, and Samples that have not first been certified, by stamped, signed notation, as having been checked and approved by the Contractor for use in the Work, or that are not specifically required by the Contract Documents.

At Section **3.12.7**, correct the word "approved" in the last line to read "accepted".

At Section **3.12.8**, correct “Architect’s approval” in the last line to read “Architect’s acceptance”.

At Section **3.12.9**, correct “Architect’s approval” in the last line to read “Architect’s acceptance” and add the following Section:

3.12.9.1 Deviation from the requirements of the Contract Documents indicated on shop Drawings, Product Data, and Samples, does not constitute the required notification “in writing.

Add Sections **3.12.11** and **3.12.12** as follows:

3.12.11 The Contractor shall submit complete Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents to the Architect at least thirty (30) days prior to the date the Contractor needs the reviewed submittals returned. Where colors are to be selected by the Architect, submit all Samples in adequate time to allow the Architect to prepare a complete selection schedule. In general, all submittals requiring color selection shall be submitted to the Architect within four weeks of the date of the contact for construction.

3.12.12 The Contractor shall submit digital PDF’s of Shop Drawings, Product Data, and similar submittals in the proper format according to the procedures stipulated within the Contract Documents. Digitally submitted Shop Drawings will be reviewed and marked by the Architect and/or his consultants and returned to the Contractor for his use, distribution, correction or resubmittal as required. Contractor corrections or revisions shall be resubmitted to the Architect in accordance with same procedures. The digitally marked up prints will be retained by the Architect and his consultants. Samples shall be submitted directly to the Architect for review.

Add Section 3**.12.13** as follows:

3.12.13 The Contractor shall provide MEP coordination drawings within a schedule mutually agreed upon by the Team and prior to installing the Work, showing how all piping, ductwork, lights, conduit, equipment, etc. will fit into the ceiling space allotted, including clearances required by the manufacturer, by code, or in keeping with good construction practice. Space for all trade elements must be considered on the same drawing. Drawings shall be at ¼ inch per foot minimum scale and shall include invert elevations and sections required to meeting intended purpose. The Contractor may propose an alternate method of accomplishing MEP coordination. If the alternate method is approved by the Team, it may be utilized.

3.14 CUTTING AND PATCHING

Add Section **3.14.3** as follows:

3.14.3 Leave all chases, holes and openings, straight and true, of proper size, and cut them into existing work as may be necessary for the proper installation of the work. Consult with all Subcontractors concerned, regarding proper locations and size. In case of conflict between requirement for cutting and patching and any other requirement of the Work, submit request for direction before proceeding with the Work. In case of failure to leave or cut them in the proper place, openings shall be cut afterward at no expense to the Owner. No excessive cutting will be permitted, nor shall any piers or other structural members be cut without prior approval. After such work has been installed, satisfactorily and carefully fit around, close up, repair, patch, and point up all cuts. Work shall be done with proper tools by workmen of the particular trade to which work belongs and shall be done without extra expense to the Owner. No description of specific cutting, patching, digging, etc., required for the work under a Specification Section that may be required for the proper accommodation of that work to the work of other trades shall relieve the Contractor from responsibility described above.

3.15 CLEANING UP

Add Section **3.15.3** as follows:

3.15.3 Prior to the Architect’s inspection for Substantial Completion the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roof, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site.

3.18 INDEMNIFICATION

Delete Sections **3.18.1** and **3.18.2** in their entirety and replace them with the following:

3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES (COLLECTIVELY, THE "INDEMNIFIED PARTIES") FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OF ANY EMPLOYEE OF CONTRACTOR, ITS AGENTS, OR ITS SUBCONTRACTORS OF EVERY TIER, EVEN IF THE BODILY INJURY, SICKNESS, DISEASE OR DEATH IS CAUSED BY OR ALLEGED TO HAVE BEEN CAUSED BY THE NEGLIGENCE, FAULT OR STRICT LIABILITY OF ANY OF THE INDEMNIFIED PARTIES.

FOR ALL CLAIMS NOT ADDRESSED IN THE ABOVE PARAGRAPH, CONTRACTOR SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES AND (COLLECTIVELY, THE "INDEMNIFIED PARTIES"), FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, OF ANY NATURE WHATSOEVER ARISING OUT OF OR RELATED TO THIS AGREEMENT OR THE WORK TO BE PERFORMED UNDER THIS AGREEMENT, BUT ONLY TO THE EXTENT OF THE NEGLIGENCE OR OTHER FAULT OF THE CONTRACTOR, ITS AGENTS, REPRESENTATIVES, EMPLOYEES OR SUBCONTRACTORS OF ANY TIER.

3.18.2 It is understood and agreed that Subparagraph 3.18 above is subject to, and expressly limited by, the terms and conditions of TEX. CIV. PRACT. & REM. CODE ANN. 130.001-130.005 (Vernon Supp. 1989), as amended or modified, or any successor statute. Contractor shall not be obligated under Subparagraph 3.18 to indemnify or hold harmless Architect or any agent, servant of employee of Architect from liability or damage that is caused by or results from:

.1 defects in plans, designs or specifications prepared, approved or used by the Architect; or

.2 negligence of the Architect in the rendition or conduct of professional duties called for or arising out of the Contract Documents and the plans, designs or specifications that are a part of the Contract Documents; and arises from:

.1 personal injury or death;

.2 property injury; or

.3 any other expense that arises from personal injury, death or property injury.

Add Section **3.18.3** as follows:

3.18.3 It is agreed with respect to any legal limitations, now or hereafter in effect and affecting the validity or enforceability of the indemnification obligation under Paragraph 3.18, such legal limitations are made a part of the indemnification obligation and shall operate to amend the indemnification obligation to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the indemnification obligation shall continue in full force and effect.

Add Sections **3.20**

3.20 THIRD-PARTY BENEFICIARY

3.20 No person or entity shall be deemed to be a third-party beneficiary of any provision(s) of this Contract; nor shall any provision(s) hereof be interpreted to create a right of action or otherwise permit anyone not a signatory party to the Contract to maintain an action for personal injury or property damage.

ARTICLE 4 – ARCHITECT

4.2 Administration of the Contract

Delete Section **4.2.2** in its entirety and substitute the following:

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the work, and (3) to determine in general if the work is being performed in a manner indicating that the work, when fully completed, will be in accordance with the Contract documents. The Architect will be required to make on-site inspections as necessary to keep the Owner informed of the progress of the Work and as necessary to guard the Owner against defects and

deficiencies in the Work. The Architect will neither have control over or charge of, no be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

Delete Section **4.2.6** in its entirety and substitute the following:

4.2.6 The Architect shall have authority to reject Work that does not conform to the Contract Documents. The Architect shall be required to promptly notify the Owner of any non-conforming Work and shall reject such non-conforming Work unless the Owner objects to the rejection in writing within twenty-four (24) hours of such notification. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract documents, the Architect will have authority to require inspection or testing of the Work in accordance with the provisions of the Contract Documents, whether or not such Work is fabricated, installed or completed. Performance of any additional inspection or testing, which would result in additional cost to the Owner, shall require advance notice to and approval of the Owner. 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, except when the Contractor's inability to perform the Work is a result of design flaw, error or omission.

Add the following Section **4.2.8.1**:

4.2.8.1 Allowance Expenditure will be authorized using Allowance Expenditure authorizations (AEA) executed by the Owner, the Architect and the Contractor. All Allowance Expenditure Authorizations will be incorporated into the contract by Change Order at the completion of the project. Work authorized by an AEA may be invoiced as it is completed.

Delete Section **4.2.13** in its entirety and substitute the following:

4.2.13 All decisions on matters relating to aesthetic effect shall initially be made by the Architect; however, all such decisions are subject to the Owner's written approval.

ARTICLE 5 – SUBCONTRACTORS

5.1 DEFINITIONS

At the end of Section **5.1.1** add the following sentence:

Wherever relevant, the term "Subcontractor" shall also include a person, or entity who supplies material or equipment for the Project.

At the end of Section **5.2.4**, add the following sentence:

Prior to such change the Contractor shall notify the Architect of his intent and reasons for such proposed changes.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Delete the last sentence of Section **5.4.1** in its entirety and substitute the following:

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract, but only to the extent permitted by law.

Delete the last sentence of Section **5.4.3** in its entirety.

ARTICLE 7 -- CHANGES IN THE WORK

7.1 GENERAL

Delete the text of Section **7.1.2** in its entirety and substitute the following:

7.1.2 A Change Order shall be based on agreement among the Owner, Contractor, and Architect, except when the Contract balance is amended as a result of Owner's Right to Carry out the Work under Section 2.4.1 or the Owner's assessment of liquidated damages as allowed by the Contract Documents. A Construction Change Directive requires agreement by the Owner or the Owner's representative and Architect, and may or may not be agreed to by the Contractor; an order for a minor change may be issued by the Architect alone.

Add Section **7.5** as follows:

7.5 ALLOWABLE MARKUPS FOR CHANGES IN THE WORK

7.5.1 Unless otherwise directed, the procedure and markup of the costs for additional work shall be determined in the following manner:

.1 Upon Change Proposal request, the Contractor shall quote the cost for changes in the work showing separately, credits and additional costs broken down by headings used in the Schedule of Values. Further breakdown into units of labor and materials may be required if agreement on cost cannot be reached using the breakdown by headings. The final cost shall be the amount of the Total Contract Value Change shown on the Change Proposal signed by the Contractor and Owner. For general construction work, not subcontracted, the Contractor shall consider as costs the actual invoice amount for additional materials, the sales tax on additional materials when applicable, the wages paid for additional direct labor, plus the Contractor's usual markup of wages to cover additional labor related costs such as insurance, taxes and fringe benefits.

.2 On changes executed within the Owner's Contingency Allowance, Contractor shall have included costs for combined overhead and profit, to the extent permitted by the Contract Documents, and General Conditions costs, including the cost of superintendents, field office expense, temporary facilities and services, small hand tools, construction equipment not specifically provided for the change in hand, home office expense, bond and building insurance premiums, and managing the Subcontractor's work, in his Base Contract amount. Allowed overhead and profit fee on Owner's Contingency Allowance changes to be included in the total cost to the Owner shall be based as follows:

.1 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's of Sub-subcontractor's own forces, ten percent (10%) of the cost.

.2 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractors.

7.5.2 If any additional Work is authorized outside of or in excess of the Owner's Contingency Allowance, the combined overhead and profit for this work shall be based as follows:

.1 For the Contractor, for Work performed by the Contractor's own forces, a maximum total markup of ten percent (10%) of the actual cost on a lump sum project, or the Contractor's Construction Phase Fee on a Guaranteed Maximum Price Project.

.2 For Work performed by the Contractor's Subcontractor(s), five percent (5%) of the amount due the Subcontractor(s).

.3 For each Subcontractor or Sub-subcontractor involved, for work performed by that Subcontractor's or Sub-subcontractor's own forces, a maximum markup of ten percent (10%) of the actual cost.

.4 For each Subcontractor, for work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

7.5.3 In order to facilitate checking of quotations for extras or credits, all proposals, (except those so minor that their propriety can be seen by inspection), shall be accompanied by a complete and detailed itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

7.5.4 Change orders, as they are accepted by the Owner, shall be entered under heading "Change Orders" in the next current Request for Payment.

7.5.5 All credits to or deductions from the Contract Sum, a Contingency or an Allowance shall be calculated using the same methodology set forth in this Section 7.5.

ARTICLE 8 -- TIME

8.1 DEFINITIONS

At Section **8.1.4**, add the following sentence:

See further definition of “Day” in Section **1.9.10**.

8.3 DELAYS AND EXTENSIONS OF TIME

Delete Section **8.3.1** in its entirety and substitute the following:

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 unforeseeable causes beyond the Contractor’s control, or by other causes which 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.

Add Sections **8.3.4** and **8.3.5** as follows:

8.3.4 The parties hereto agree that time is of the essence of this Contract and that pecuniary damages would be suffered by the Owner if the Contractor does not substantially complete all Work called for in the Contract Document by the specified date, which damages are, by their very nature, difficult of ascertainment. It is therefore expressly agreed, as a part of the consideration inducing the Owner to execute this Contract that the Owner may deduct from the final payment made to the Contractor a sum equal to One Thousand Dollars ($1,000.00) per phase for each and every Calendar Day beyond the agreed date which the contractor has agreed to for Substantial Completion of the Work included in the Contract Documents. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not substantially completed within the agreed time, or with the legally extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only, and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. The liquidated damages assessed herein shall be Owner’s sole remedy for time delays between the deadline for substantial completion and Contractor’s achievement of substantial completion.

8.3.5 Failure to complete and close-out the Project, and complete all Punch List items, within ninety (90) days after the scheduled Substantial completion date will additionally entitle the Owner to deduct from the final payment made to the Contractor a sum equal to One Thousand Dollars ($1000.00), per phase, for each and every Calendar Day beyond the 90-day close-out period. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Project close-out does not occur on a timely basis. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. If the Contractor is delayed through no fault of the Owner, the Substantial Completion is not achieved by the agreed contract completion date, the Project close-out period of ninety (90) days will not be extended by the number of days of delay past the actual Substantial completion date and will remain based upon the agreed contract completion date.

Add Sections **8.3.6, 8.3.7, 8.3.8** and **8.3.9** as follows:

8.3.6 Extensions of time granted for causes described herein will be granted on the basis of 1.4 Calendar Days extension for each Regular Working Day lost, except as modified by the provisions contained herein related to Anticipated Inclement Weather days.

8.3.7 Each Bidder shall include in his proposed Contract Time an allowance of anticipated Inclement Weather Days in accordance with the following schedule:

Number of Anticipated inclement Weather Days to be included in Bid Completion Time (These are regular working days)

January	3	April	2	July	4	October	3
February	4	May	5	August	4	November	5
March	5	June	6	September	4	December	4

8.3.8 Weather days shall be defined in Section 1.9.9.5. If such situations occur in more than the number of anticipated Inclement Weather Days included in the Bid Completion Time and if those additional days prevent the Contractor from performing major or critical portions of the scheduled Work during the time the

Project would be subject to such weather delays, extensions of time caused by inclement weather may be requested, based on the number of days beyond this number.

8.3.9 Monthly, concurrent with the application for Payment, the Contractor shall submit a status report showing the status of Weather Days for the particular month.

ARTICLE 9 -- PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

Add Section **9.1.1.1** as follows:

9.1.1.1 The Owner is exempt from payment of Texas State Sales Tax on materials required for the Work. Therefore, to comply with the law, the Contract Sum shall be broken down into the amount of cost for labor and the amount of cost for materials. This breakdown shall be provided by the Contractor within ten (10) days of award of Contract.

9.2 SCHEDULE OF VALUES

Add the following Sections:

9.2.1 General Contractor's cost for Contractor's fee, bonds and insurance, General Conditions, etc., shall be listed as individual line items.

9.2.2 Schedule of Values shall break each line into materials and labor. Once approved by the Owner and Architect, it shall be used as basis for reviewing Application for Payment but not be taken as evidence of market or other value.

9.2.3 Contractor's cost for various construction items shall be detailed. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, paving, etc. These subdivisions shall appear as individual line items**.**

9.2.4 On major subcontracts, such as mechanical, electrical, and plumbing, the Schedule shall indicated line items and amounts in detail, (for example; underground, major equipment, fixtures, installation of fixtures, start up, etc.)

9.2.5 Costs for subcontract work shall be listed without any addition of General Contractor's costs for overhead, profit or supervision.

9.2.6 The Contractor shall include a value for the coordination documents/drawings on the schedule of values.

9.2.7 The Contractor shall include a value for the correction of deficiencies noted by the Commissioning Agent and the Test, Adjust and Balance consultant on the schedule of values for each sub-contractor subject to commissioning and test, adjust and balance requirements.

9.3 APPLICATIONS FOR PAYMENT

Delete Sections **9.3.1** and **9.3.2** in their entirety and replace them with the following:

9.3.1 No later than 3 working days prior to the first Wednesday of each month, submit an itemized Application for Payment, supported by such data sustaining the Contractor's right to payment as the Owner or Architect may require, and reflecting retainage, as provided elsewhere in the Construction Documents. Information on the form shall be divided into the same last day of the month preceding, which shall also be the basis of payment or as agreed by the Owner, Contractor and Architect by verification at the site, prior to submittal.

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 which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

9.3.2 Payments will be made on account of materials or equipment 1) incorporated in the Work; 2) suitably stored at the site; or 3) suitably stored at some off-site location, provided the following conditions are met for off-site storage:

.1 The location must be agreed to, in writing, by the Owner and Surety.

.2 The location must be a bonded warehouse.

.3 Surety must agree, in writing, to each request for payment.

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the offsite storage area for confirmation.

Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance (naming the Owner as insured) and transportation to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment.

The Contractor acknowledges that the review of materials and/or equipment stored off the side is an additional service of the Architect, and the Contractor shall be charged for that service. The cost for such service will be established by the Architect and is not subject to appeal.

Add Section **9.3.4** as follows:

9.3.4 The Contractor shall submit requests for payment in duplicate, using AIA Document G702, Application and Certificate of Payment, as the cover sheet. Continuation sheets showing in detail the amounts requested, etc., shall be submitted using AIA Document G703, Continuation Sheet, or a computerized version of these documents previously approved for use. The information provided on the continuation sheets in the Description of the Work and Scheduled Values columns shall match the corresponding information shown on the approved Schedule of Values. All blank spaces on AIA Document G702, Application and Certificate of Payment, must be completed and the signatures of the Contractor and Notary Public shall be original on each form. By submitting his application for payment, the Contractor certifies that the individual signing the application is authorized to do so.

9.6 PROGRESS PAYMENTS

Delete Section **9.6.1** in its entirety and substitute the following:

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make progress payments in accordance with the following Section which shall be inserted as Article 5, Progress Payments, in the Owner-Contractor Agreement, AIA Document A101, 2017 Edition.

.1 Based upon the applications for payment and supporting documents submitted to the Architect by the Contractor and certification of the amount payable by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

.2 Not later than twenty (20) working days following the first Wednesday of each month, ninety-five percent (95%) of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work and ninety-five percent (95%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing (subject to the conditions listed in Article 9.3.2 of the Supplementary Conditions to the Contract for Construction), for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner. Applications for Payment shall be submitted by the first Wednesday of the month.

.3 Upon Substantial Completion of the entire Work, a sum sufficient to increase the total payments to ninety-five percent (95%) of the Contract Sum, less such amounts as the Architect shall determine for all incomplete Work and unsettled claims as provided in the Contract Documents.

At Section **9.6.2**, insert the following sentence between the first and second sentence:

More specifically, if only five percent (5%) retainage is withheld by the Owner on payments to the Contractor, then the Contractor shall withhold only five percent (5%) retainage on payments to subcontractors; and subcontractors shall withhold only five percent (5%) retainage on payments to sub-subcontractors.

9.7 FAILURE OF PAYMENT

Delete the phrase "or awarded by binding dispute resolution." Replace all references to "seven days" to "ten days."

9.8 SUBSTANTIAL COMPLETION

At Section **9.8.2**, add the following sentence at the end:

Should the Architect determine that the Contractor's List of Items to be Completed or Corrected lacks sufficient detail or requires extensive supplementation, the list will be returned to the Contractor for revision, and inspection for determining the Date of Substantial Completion will be delayed until the List submitted is a reasonable representation of the work to be done.

Add Sections **9.8.6** and **9.8.7** as follows:

9.8.6 In order for the project or a major portion thereof to be considered substantially complete, the following conditions must be met:

.1 All inspections by governmental authorities having jurisdiction over the project must have been finalized, any remedial work required by those authorities must have been completed, and Certificates of Occupancy and similar governmental approval forms must have been issued and copies delivered to the Owner and Architect.

.2 All work, both interior and exterior, shall have been completed and cleaned except minor items which if completed after occupancy, will not, in the Owner's opinion, cause interference to the Owner's use of the building or any portion thereof. A significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judge of what constitutes a significantly large number of items.

The following items are a partial specific list of requirements, as applicable to the Project, that must be completed prior to established Substantial Completion of all portions of the work (Including the Substantial Completion of the commissioning phase).

1. All fire alarm system components must be completed and demonstrated to the Owner.
2. Local fire marshal approval certificate, or similar Certificate of Occupancy from the governing agency, must be delivered to the Owner.
3. All exterior clean-up and landscaping must be complete.
4. All final interior clean-up must be complete.
5. All HVAC air and water balancing must be complete.
6. All required commissioning must be complete.
7. All Energy Management Systems must be complete and fully operational and demonstrated to the Owner.
8. All communications equipment, telephone system, and P.A. systems must be complete and demonstrated to the Owner.
9. All final lockset cores must be installed and all final Owner directed keying completed.
10. All room plaques and exterior signage must be completed.
11. All Owner demonstrations must be completed including kitchen equipment, HVAC equipment, plumbing equipment, and electrical equipment.
12. A final certificate of occupancy must be signed by the Contractor and delivered to the Owner.

9.8.7 After the date of Substantial Completion of the Project is evidenced by the Certificate of Substantial Completion, the Contractor will be allowed a period of time within which to correct all deficiencies attached to the Certificate of Substantial Completion as outlined in Section 8.3.4 of these supplementary conditions. Failure of the Contractor to complete such corrections within the stipulated time will be reported to the contractor's surety. In this report, the Contractor and surety will be informed that, should correction remain incomplete for fifteen (15) days, the Owner may initiate action to complete corrective work out of the remaining Contract funds in accordance with Article 14.2.

.1 Should corrective work following Substantial Completion require more than one reinspection after notification by the Contractor that corrections are complete, the cost of subsequent inspections may also be deducted from the Contract funds remaining unpaid to the Contractor.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Add Section **9.10.6** as follows:

9.10.6 Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor thirty-one (31) days after Substantial Completion of the Work unless otherwise stipulated in the Certificate of Substantial Completion, provided the Work has then been completed, the Contract fully performed, all Contract Close Out Documents have been submitted, and the Final Certificate for Payment has been issued by the Architect. The final payment will not be made until all of these conditions have been satisfied.

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

Add Sections **10.2.9** and **10.2.10** as follows:

10.2.9 The performance of the foregoing services by the Contractor shall not relieve the Subcontractors of their responsibilities for the safety of persons and property and for compliance with all applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to the conduct of the Work.

10.2.10 The Contractor shall be responsible for taking all precautions necessary to protect the Work in place from any foreseeable weather conditions which could cause any potential damage to portions or all Work in place. The Contractor shall be responsible for performing all repairs and/or replacement of any Work that results from foreseeable weather conditions.

10.3 HAZARDOUS MATERIALS

Delete the text of Section **10.3.1** in its entirety and substitute the following:

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 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. The Owner, Contractor and Architect shall then proceed in the same manner described in section 10.3.2.

Delete the text of Sections **10.3.3, 10.3.4** and **10.3.5** in their entirety.

Delete the text of Section **10.3.6** in its entirely and substitute the following:

10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a governmental 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 costs and expenses thereby incurred, but only to the extent provided by law.

Add Section **10.3.7** as follows:

10.3.7 As part of the construction contract close out process, and prior to receiving payment of any of the retainage, the Contractor and his subcontractors shall submit notarized statements pertaining to the above referenced hazardous materials.

ARTICLE 11 -- INSURANCE AND BONDS

Delete the text of Sections 11.1 through 11.5 and substitute the following Sections:

11.1 CONTRACTOR'S LIABILITY INSURANCE

The Owner reserves the right to review the insurance requirements during the effective period of any Contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by Owner based upon changes in statutory laws, court decisions or potential increase in expense to loss.

11.2 The Owner requires the following minimum insurance coverages:

Types of Coverage	Limits of Liability	
Commercial General Liability	General Aggregate	$2,000,000.00
	Products/Completed Operations/Aggregate	$1,000,000.00
	Bodily Injury and Property Damage (each)	$1,000,000.00

Contractual	$1,000,000.00
Personal and Advertising Injury	$1,000,000.00
Fire Damage	$500,000.00
Medical Expense	$5,000.00

11.2.1 The Owner shall be named as an additional insured on a primary and non-contributory basis using form CG 2010 10 01 or similar endorsement providing equal or greater coverage in favor of the Owner.

Coverage shall include the following:

(a) Premises operations;

(b) Blanket Contractual Liability;

(c) Pollution;

(d) Products/Completed Operations;

(e) Broad Form Property Damage;

(f) Independent Contractors;

(g) Per project aggregate limit;

(h) Provide a statement of claims against the aggregate limit with each renewal certificate;

(i) X,C,U exclusions to be removed when underground work is performed; and

(j) Waivers of subrogation in favor of Owner and its officers, directors, representatives, agents and employees shall be provided.

11.2.2 Automobile Liability — Combined Single Limit — $1,000,000.00

(a) Comprehensive Automobile Liability Insurance to cover all vehicles owned by, hired by, or used on behalf of Contractor.

(b) Owner and its officers, directors, representatives, agents and employees shall be endorsed as Additional Insureds, as their interests may appear.

(c) Waivers of subrogation in favor of Owner and its officers, directors, representatives, agents and employees shall be provided.

11.2.3 Workers' Compensation — Statutory Limits

(a) Coverage at Statutory Limits with All States Endorsement

(b) Employer's Liability

Each Accident	$1,000,000.00
Disease (Policy Limit)	$1,000,000.00
Disease (Each Employee)	$1,000,000.00

(c) Waivers of subrogation in favor of Owner and its officers, directors, representatives, agents and employees shall be provided.

11.2.4 Excess or Umbrella Insurance (provides coverage in excess of primary Commercial General Liability, Automobile Liability, and Worker's Compensation Coverage B limits)

(a) Minimum coverage for the Contractor shall be one (1) times the Contract amount, subject to a minimum limit of $1,000,000.00 and a maximum limit of $25,000,000.00. Limits for primary policies may differ from those shown above when Excess (Umbrella) Insurance coverage is provided.

(b) Owner and its officers, directors, representatives, agents and employees shall be endorsed as Additional Insureds, as their interests may appear.

(c) Waivers of subrogation in favor of Owner and its officers, directors, representatives, agents and employees shall be provided.

11.2.5 Additional Requirements for Architects, Engineers and Design Professionals (each a "Professional"):

(a) Professional Liability policy limits shall be one (1) times compensation amount due such Professional under the Contract, subject to a minimum limit of $1,000,000.00 and a maximum limit of $25,000,000.00.

(b) Professional Liability policies issued on a "claims made" basis must have a retroactive date shown on the certificate preceding date of contract. Such policies must include an Extended Reporting Period three years past completion of construction contract.

(c) Minimum coverage for excess (umbrella) insurance for Architects, Engineers and Design Professionals shall be one (1) times compensation amount due such Professional under the Contract, subject to a minimum limit of $1,000,000.00 and a maximum limit of $425,000,000.00. To the extent of Commercial General Liability coverage for the Professional exceeds $1,000,000.00, such amount may be used as a credit against the Excess (Umbrella) Insurance requirement set out in the preceding sentence.

11.2.6 Insurance Limits for Consultants hired by a Professional

(a) Notwithstanding Section 11.1.2.1 above, Consultants shall have the following minimum insurance requirements:

(1) Worker's Compensation:	Statutory Limits	
Employer's Liability	Each Accident	$1,000,000.00
	Disease (Policy Limit)	$1,000,000.00
	Disease (Each Employee)	$1,000,000.00
(2) Commercial General Liability	General Aggregate	$1,000,000.00
	Products/Completed Operation Aggregate	$1,000,000.00
	Bodily Injury and Property Damage (each)	$1,000,000.00
	Personal and Advertising Injury	$1,000,000.00
(3) Automobile Liability	Per Person/Accident	$1,000,000.00
(4) Professional Liability	Program Limits, If applicable	$1,000,000.00

Professional Liability policies issued on a "claims made" basis must have a retroactive date shown on the certificate preceding date of contract. Such policies must include an Extended Reporting Period three years past completion of Construction Contract.

11.3 The Owner requires that the following insurance requirements be satisfied:

.**1** No Work shall be commenced until all insurance requirements set forth in this Agreement have been approved by the Owner in writing.

.**2** All insurance policies and certificates required hereunder shall be in form and content satisfactory to the Owner.

.**3** The Owner shall be furnished an ACORD form Certificate of Insurance evidencing all policies and endorsements required by this Agreement prior to execution of the Contract and thereafter upon renewal or replacement of each required policy of insurance.

.4 Each Insurance coverage/policy shall contain a provision that at least thirty (30) days prior written notice shall be given to the Owner in the event of cancellation, material change, or non-renewal.

.5 Insurance shall be underwritten by a company licensed to do business in Texas, satisfactory to Owner and rated minimum A-VII by A.M. Best.

.6 The insurance coverages specified herein shall be maintained at all times during the term of the contract and, with the exception of builder's risk coverage, shall be maintained for a minimum of one (1) year thereafter.

.7 No deletions/exclusions from the standard coverage form are allowed without the prior written consent of the Owner.

.8 All insurance except Professional Liability must be issued on an occurrence basis.

.9 The Contractor shall be responsible for all deductibles; the Owner shall approve the deductibles selected.

.10 With the exception of Excess Umbrella Coverage, the coverage afforded by each carrier must be a primary over any other applicable insurance.

.11 In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the Owner as Additional Insures, and (b) showing waivers of subrogation in favor of the Owner.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Add the following Sections:

11.4.1 The Contractor shall provide a Performance Bond, in the penal sum equal to one hundred percent (100%) of the Contract Sum, if the formal Contract is in excess of One Hundred Thousand Dollars ($100,000.00) and a Labor and Material Payment bond, in the penal sum equal to one hundred percent (100%) of the Contract sum if the formal contract is in excess of Twenty Five Thousand Dollars ($25,000.00).

11.4.2 The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an attached authorized power of attorney. Such Bonds shall be issued by a company authorized to do business in the State of Texas with an A.M. Best Company rating of a least A-X and included on the U.S. Department of the Treasury Listing of Approved Sureties (Dept. Circular 570).

11.4.3 The Performance Bond Form and the Payment Bond Form included herein shall be executed and submitted to the Architect in duplicate prior to commencement of the work. The surety companies must be acceptable to the Owner and licensed admitted carriers in the State of Texas; and the companies must appear in a current Federal Treasury list as Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds land as Acceptable Reinsuring companies.

11.4.4 Each bond shall be of penal sum equal to one hundred percent (100%) of the Contract Sum and shall be compatible with the provisions of the governing authority. The Contractor shall file copies of each bond with the county clerk and furnish the Owner with a file receipt. The bonds shall remain in force throughout the warranty period of the contract. The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an authorized power of attorney attached.

11.4.5 Claims must be sent to the Contractor and his Surety in accordance with the requirements of Texas law. The Owner will furnish in accordance with such Article, a copy of the Payment Bond as provided therein to claimants upon request. All claimants are cautioned that no lien exists on the funds unpaid to the contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no responsibility because of any representation by any agent or employee.

ARTICLE 12—UNCOVERING AND CORRECTION OF WORK

12.2.1 BEFORE SUBSTANTIAL COMPLETION

After Section **12.2.1** add the following Section:

12.2.1**.1** In the event of failure of a specified project, either during construction or the correction period, the Contractor shall take appropriate measures with the manufacturer of the product to assure correction or replacement of the defective products.

12.2.2 AFTER SUBSTANTIAL COMPLETION

After Section **12.2.2** add the following Section:

12.2.2**.1** Approximately eleven months after substantial completion, the contractor shall accompany the Owner and Architect on an “end of the one year correction period” reinspection

of the Project. Additional deficiencies observed or reported shall be corrected by the Contractor.

12.3 ACCEPTANCE OF NONCONFORMING WORK

Number the existing provision as Section **12.3.1**, and add Section **12.3.2** as follows:

12.3.2 The Owner's use and/or occupancy of any or all of the Project site shall never be construed as an acceptance of Work not in conformance with Contract Documents. The Owner reserves the right to enforce provisions of the Contract unless the Owner's acceptance is provided to the Contractor in writing.

ARTICLE 13—MISCELLANEOUS PROVISIONS

Add Sections **13.7**, **13.8** and **13.9** as follows:

13.7 EQUAL OPPORTUNITY

13.7.1 The contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

ARTICLE 14—TERMINATION OR SUSPENSION OF THE CONTRACT

Delete the text of Section 14.1.3 in its entirety and substitute the following:

14.1.3 If one of the reasons described in Section 14.4.1 or 14.4.2 exists, the Contractor may, upon seven day's written notice to the Ower and Architect, terminate the Contract and recover from the Owner payment for Work executed as of the date of the notice, plus costs of demobilization.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete the text of Section **14.4.3** in its entirety and substitute the following:

14.4.3 In the case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed up to date of receipt of the notice of termination, plus costs of demobilization.

ARTICLE 15—CLAIMS AND DISPUTES

15.1 CLAIMS

Delete the text of Section **15.1.1** in its entirety and substitute the following:

15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of contract terms, payment of money, extension of time 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, Architect, and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. Nothing herein shall require the Owner to make or file a Claim in order to assess liquidated damages provided for in the Contract Documents.

15.1.2 TIME LIMITS ON CLAIMS

Delete the last sentence of Section **15.1.2** in its entirety.

15.1.3 NOTICE OF CLAIMS

Delete the second sentence of Section **15.1.3** in its entirety and substitute the following:

Claims by either party must be initiated within ninety (90) days after occurrence of the event giving rise to such Claim or within ninety (90) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

15.1.6 CLAIMS FOR ADDITIONAL TIME

Delete the text of **Section 15.1.6.2** in its entirety and substitute the following:

15.1.6 .2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented and listed in accordance with Article 8.

15.1.7 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete the text of Section **15.1.7** in its entirety.

15.2 INITIAL DECISION

Delete the text of Section **15.2.1** in its entirety and substitute the following:

15.2.1 Claims, excluding those alleging an error or omission by the Architect or those arising after expiration of the period for correction of the Work, 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. If the parties are unable to agree, any claim, dispute or matters arising out of the contract between the Architect, Owner and Contractor or any combination of those parties shall be submitted to a court of appropriate jurisdiction.

Delete the text of Section **15.2.5** in its entirety and substitute the following:

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 therefore; 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, if both parties so agree, and subject to legal or equitable proceedings in a court having jurisdiction thereof. It is understood and agreed that, in the event that any dispute, controversy, or conflict arises during the design and construction of the Project or following its completion, the parties hereto will cooperate in good faith, if possible, to resolve the issues without resorting to litigation.

Delete the text of Sections **15.2.6** and **15.2.6.1** in their entirety.

Add the following Section **15.2.9**

15.2.9 The prevailing party in any judicial proceeding arising from the Contract Documents shall recover its reasonable and necessary attorneys' fees.

15.3 MEDIATION

15.3.1 Delete the text of **15.3.1** in its entirety.

Delete Section **15.3.2** in its entirety and replace with the following:

15.3.2 The parties may mutually agree to resolve their claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract. Mediation shall proceed in advance of legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing unless stayed for a longer period of agreement of the parties or court order.

15.4 ARBITRATION

Delete the text of Sections **15.4.1** through **15.4.3** and **15.4.4.1** through **15.4.4.3** in their entirety.

END OF DOCUMENT

SECTION 00 73 43 - WAGE RATE REQUIREMENTS

PART 1. GENERAL

1.1 Requirements:

A. Pay not less than the most current minimum wage scale and benefits accepted within Davis-Bacon Act for Building Construction Projects for the State and County of the project location.

B. No claims for additional compensation will be considered by the Owner because of payments of wage rates in excess of the applicable rate contained in this contract.

C. All contractors and subcontractors shall be equal opportunity employers.

1.2 Workmanship Standards:

Comply with the recognized workmanship quality standards within the industry as applicable to each unit of work, including ANSI standards where applicable. Project workmen should be paid in accordance with accepted pay scales for similar experience level and work in the area. It is a requirement that each category of tradesman or installer performing the work be pre-qualified, to the extent of being familiar with the applicable and recognized quality standards for his category of work and being capable of workmanship complying with those standards.

1.3 Payroll:

A. In compliance with Article 515a, Sections 2 and 3, and Article 5159d, Section II of the Revised Civil Statute referenced above, the Owner reserves the following rights:

1. To receive weekly payroll records.

2. To have the Contractor provide required earning statements to employees.

1.4 Minimum Wage Rates:

A. Pay prevailing basic wage listed for State and County of project location plus any applicable fringe benefits.

B. In no case shall wages be less than the federally determined prevailing (Davis-Bacon and Related Acts) wage rate, as issued by the Texas Department of Housing and Community Affairs and contained in the contract documents, must be paid on this project. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, sex, age or national origin.

1.5 PREVAILING WAGE SCALE NOTICE

A. This determination of prevailing wages shall not be construed to prohibit the payment of more than the rates named. Under no conditions shall any laborer, workman or mechanic employed on this job be paid less than the minimum wage scale.

B. In execution of this contract, the contractor must comply with all applicable state and federal laws, including but not limited to laws concerned with labor, equal employment opportunity, safety, and minimum wage.

END SECTION 00 73 43

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Work restrictions.
5. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Public Safety Center.

1. Project Location: 705 W Avenue A, Port Aransas, TX 78373.

B. Owner: City of Port Aransas.

1. Owner's Representative: David Parsons, City Manager.

C. Architect: Gignac & Associates, 416 Starr St., Corpus Christi, Texas, 78401.

1. Architect's Representative: Paul Rybalka, Project Manager, Gignac Architects.

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Civil Engineers: Urban Engineering, Corpus Christi, TX.
2. Structural Engineer: Green-Rubiano & Associates, Harlingen, Texas
3. Mechanical-Electrical-Plumbing Engineer: MS2 Engineering, Inc, Corpus Christi, Texas

E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. New Public Safety Center: Construction of new single story Public Safety Center with associated site improvements and other Work indicated in the Contract Documents. General construction shall consist of, but is not limited to; architectural, landscape & irrigation, civil, structural, mechanical, electrical, plumbing.

B. Type of Contract:

1. Each bid item separately or a combination of all three bid items will be constructed under a single prime contract.

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.5 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to working hours of 7:00 a.m. to 9:00 p.m., Monday through Saturday, unless otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect & Owner not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect & Owner not less than two days in advance of proposed disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.

3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.

4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Contingency allowances.
3. Testing and inspecting allowances

C. Related Requirements:

1. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's related costs, excluding overhead and profit, for products and equipment provided under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs, excluding overhead and profit.

D. Overhead and Profit: Overhead and profit, related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance

E. At Project closeout, credit unused amounts remaining, in the contingency allowance to Owner by Change Order including overhead and profit.

1.9 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.4 SCHEDULE OF LUMP SUM ALLOWANCES

A. Allowance No. 1: Include the Lump Sum of $8,000.00 for miscellaneous concrete reinforcement bars, as specified in Section 032000 CONCRETE REINFORCEMENT and as shown on Drawings.

B. Allowance No. 2: Include the Lump Sum of $20,000.00 for miscellaneous structural steel, as specified in Section 051200 STRUCTURAL STEEL and as shown on Drawings.

C. Allowance No. 3: Include the Lump Sum of $8,000.00 for miscellaneous dimensional lumber, as specified in Section 061000 ROUGH CARPENTRY and as shown on Drawings.

3.3 SCHEDULE OF OWNER'S CONTINGENCY ALLOWANCES

A. Allowance No. 4: Owner's Contingency Allowance: Include a Contingency Allowance of $360,000.00 for Owner's and Architect's Use Only, according to Architect's written instructions.

3.5 SCHEDULE OF TESTING & INSPECTION ALLOWANCES

B. Allowance No. 5: Owner/Architect Testing & Inspection Allowance: Include an Owner/Architect Testing & Inspection allowance of $120,000.00 for use according to Architect's written instructions.

END OF SECTION 01 21 00

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES, Texas Department of Insurance Product Evaluation.
    j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    k. Cost information, including a proposal of change, if any, in the Contract Sum.
    l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
    m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
      c. Substitution request is fully documented and properly submitted.
      d. Requested substitution will not adversely affect Contractor's construction schedule.
      e. Requested substitution has received necessary approvals of authorities having jurisdiction.
      f. Requested substitution is compatible with other portions of the Work.
      g. Requested substitution has been coordinated with other portions of the Work.
      h. Requested substitution provides specified warranty.
      i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
      b. Requested substitution does not require extensive revisions to the Contract Documents.
      c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
      e. Substitution request is fully documented and properly submitted.
      f. Requested substitution will not adversely affect Contractor's construction schedule.
      g. Requested substitution has received necessary approvals of authorities having jurisdiction.
      h. Requested substitution is compatible with other portions of the Work.
      i. Requested substitution has been coordinated with other portions of the Work.
      j. Requested substitution provides specified warranty.
      k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect**.**

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

A. Architect's Supplemental Instructions: Architect may issue Architect's Supplemental Instructions on AIA Document G710. Architect's Supplemental Instructions instructs Contractor to proceed with a change in the Work, provided there is no change in contract sum or time. Proceeding with the work acknowledges that there will be no change in contract sum or time.

1. Architect's Supplemental Instructions contain a complete description of change in the Work.

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 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.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Change Orders (numbers) that affect value.
    e. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
        1) Labor.
        2) Materials.
        3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent (5%) of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
    4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
    1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
    2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
    3. Provide summary documentation for stored materials indicating the following:
        a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
        b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
        c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
F. Transmittal: Submit four (4) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.
    1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. Schedule of values.
2. Contractor's construction schedule (preliminary if not final).
3. Schedule of unit prices.
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Initial progress report.
9. Report of preconstruction conference.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. RFIs.
   4. Digital project management procedures.
   5. Project meetings.

B. Related Requirements:
   1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   2. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
      a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative

sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
   1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
   2. Plenum Space: Indicate subframing for support of ceiling [, raised access floor,] and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
   3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
   4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
   5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
   6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
   1. File Preparation Format:
      a. Same digital data software program, version, and operating system as original Drawings.
   2. File Submittal Format: Submit or post coordination drawing files using PDF format.
   3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
      a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
      b. Digital Data Software Program: Drawings are available in Autodesk AutoCAD/Revit in Microsoft.
      c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Owner name.
   2. Owner's Project number.
   3. Name of Architect.
   4. Architect's Project number.
   5. Date.
   6. Name of Contractor.
   7. RFI number, numbered sequentially.
   8. RFI subject.
   9. Specification Section number and title and related paragraphs, as appropriate.
   10. Drawing number and detail references, as appropriate.
   11. Field dimensions and conditions, as appropriate.
   12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   13. Contractor's signature.

14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow ten days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model/CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in Autodesk AutoCAD/Revit in Microsoft.
4. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement.
    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106.
5. Contractor shall also execute Architect’s “Release of Electronic Files” form.
6. The following digital data files will be furnished for each appropriate discipline:
    a. Site plan
    b. Floor plans.
    c. Reflected ceiling plans.

B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project management software includes, at a minimum, the following features:

a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
c. Document workflow planning, allowing customization of workflow between project entities.
d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
e. Track status of each Project communication in real time, and log time and date when responses are provided.
f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Processing and tracking of payment applications.
h. Processing and tracking of contract modifications.
i. Creating and distributing meeting minutes.
j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility, including smartphones and tablets.

2. Provide up to ten web-based Project management software user licenses for use of Owner, Architect, and Architect's consultants. Provide ten hours of software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Procore Technologies, Inc.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Responsibilities and personnel assignments.
   b. Tentative construction schedule.
   c. Phasing.
   d. Critical work sequencing and long lead items.
   e. Designation of key personnel and their duties.
   f. Lines of communications.
   g. Use of web-based Project software.
   h. Procedures for processing field decisions and Change Orders.
   i. Procedures for RFIs.
   j. Procedures for testing and inspecting.
   k. Procedures for processing Applications for Payment.
   l. Distribution of the Contract Documents.

m. Submittal procedures.
n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises and existing building.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Sustainable design requirements.
   i. Review of mockups.
   j. Possible conflicts.
   k. Compatibility requirements.
   l. Time schedules.
   m. Weather limitations.
   n. Manufacturer's written instructions.
   o. Warranty requirements.
   p. Compatibility of materials.
   q. Acceptability of substrates.
   r. Temporary facilities and controls.
   s. Space and access limitations.
   t. Regulations of authorities having jurisdiction.
   u. Testing and inspecting requirements.
   v. Installation procedures.
   w. Coordination with other work.
   x. Required performance results.
   y. Protection of adjacent work.
   z. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site use.
        10) Temporary facilities and controls.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Status of RFIs.
        16) Status of Proposal Requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Special reports.

B. Related Requirements:
   1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
   2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file.

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

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

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

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

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

G. Daily Construction Reports: Submit as required.

H. Material Location Reports: Submit as required.

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

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

K. Qualification Data: For scheduling consultant.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, subcontractors, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   3. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   5. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   2. Work Restrictions: Show the effect of the following items on the schedule:
      a. Partial occupancy before Substantial Completion.
      b. Provisions for future construction.
      c. Seasonal variations.
      d. Environmental control.
   3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
      a. Submittals.
      b. Mockups.
      c. Fabrication.
      d. Sample testing.
      e. Installation.
      f. Tests and inspections.
      g. Adjusting.
      h. Curing.
      i. Building flush-out.
      j. Startup and placement into final use and operation.
   4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
      a. Structural completion.
      b. Temporary enclosure and space conditioning.
      c. Permanent space enclosure.
      d. Completion of mechanical installation.
      e. Completion of electrical installation.
      f. Substantial Completion.

D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.

4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

E. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of date established for commencement of the Work.

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

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

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

B. CPM Schedule: Prepare Contractor's construction schedule using a **cost- and resource-loaded,** time-scaled CPM network analysis diagram for the Work.

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

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Delivery.
    d. Fabrication.
    e. Installation.
    f. Testing and commissioning.
    g. Punch list and final completion.
    h. Activities occurring following final completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

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

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.

3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

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

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

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (see special reports).
8. Stoppages, delays, shortages, and losses.
9. Emergency procedures.
10. Orders and requests of authorities having jurisdiction.
11. Change Orders received and implemented.
12. Construction Change Directives received and implemented.
13. Equipment or system tests and startups.
14. Partial completions and occupancies.
15. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information.

Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within 1 one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect**,** Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 3200

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Periodic construction photographs.
   2. Final completion construction photographs.

B. Related Requirements:
   1. Section 012200 "Unit Prices" for procedures for unit prices for extra photographs.
   2. Section 013300 "Submittal Procedures" for submitting photographic documentation.
   3. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
   4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
   5. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within seven (7) days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 10 megapixels.
   2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Date photograph was taken.
      c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      d. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

D. Periodic Construction Photographs: Take twenty (20) photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take twenty (20) color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

1. Do not include date stamp.

END OF SECTION 01 32 33

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list.
   3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
   5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   9. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
   10. Section 018113.43 "Sustainable Design Requirements - ASHRAE 189.1" for sustainable design submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal Category: Action; informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled dates for purchasing.
      h. Scheduled date of fabrication.
      i. Scheduled dates for installation.

j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:
   1. Project name.
   2. Date.
   3. Name of Architect.
   4. Name of Contractor.
   5. Name of firm or entity that prepared submittal.
   6. Names of subcontractor, manufacturer, and supplier.
   7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
   8. Category and type of submittal.
   9. Submittal purpose and description.
   10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
   11. Drawing number and detail references, as appropriate.
   12. Indication of full or partial submittal.
   13. Location(s) where product is to be installed, as appropriate.
   14. Other necessary identification.
   15. Remarks.
   16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
      a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

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

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.
2. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit [one] <insert number> full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
   1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
   2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
   3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
   4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
   5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
   6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:
   1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
    1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.
    1. Prepare delegated-design drawings in the following format: [Same digital data software program, version, and operating system as original Drawings] <insert software name and version>.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
    1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
    1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
E. Architect will discard submittals received from sources other than Contractor.
F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. Section 012100 "Allowances" for testing and inspection allowances.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

F. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

G. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements,

indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

C. Reports: Prepare and submit certified written reports and documents as specified.

D. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.

3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Engage a qualified testing agency to perform quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

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

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.

15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1].

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch-(3.8-mm-)thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch-(60-mm-)OD line posts and 2-7/8-inch-(73-mm-) OD corner and pull posts, with 1-5/8-inch-(42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
    a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

F. Telephone Service: Provide project superintendent with cellular telephone for use while on jobsite.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 012500 "Substitution Procedures" for requests for substitutions.
3. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.
3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:
1. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
    a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"
2. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
    a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"
3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of , and limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

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

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

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by , certifying that location and elevation of improvements comply with requirements.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. 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. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

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

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

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

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

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. 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.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will 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 condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over

entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel .
1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel .
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

3.8 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous construction waste.

B. Related Requirements:

1. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 7419

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
   2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
   3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Submit testing, adjusting, and balancing records.
   5. Submit sustainable design submittals not previously submitted.
   6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of [10] <Insert number> days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   3. Complete startup and testing of systems and equipment.
   4. Perform preventive maintenance on equipment used prior to Substantial Completion.
   5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, [starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.
4. Submit list of incomplete items in the following format:
a. MS Excel electronic file or PDF electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

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

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

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

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit on digital media acceptable to Architect.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
        1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
    p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

B. Related Requirements:
   1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
   1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.

3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

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

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

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

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

I. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

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

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

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

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 017300 "Execution" for final property survey.
   2. Section 017700 "Closeout Procedures" for general closeout procedures.
   3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit [one] <insert number> set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit record digital data files and one set(s) of plots.
         2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit record digital data files and one set of record digital data file plots.
         2) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.

c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or [Construction] [Work] Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file[with comment function enabled].
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

C. Format: Submit record Product Data as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file] [paper copy.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 7839

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.
   2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Provide an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 7900

SECTION 02 41 16 - STRUCTURE DEMOLITION

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. Demolition and removal of buildings and site improvements.
2. Abandoning in-place below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse . Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site .

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

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

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

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

D. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by salvage and

demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.

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

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

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

1.9 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
    a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If materials 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.

E. On-site storage or sale of removed items or materials is not permitted.

1.10 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

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

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

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

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

F. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

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

B. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner .

5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
   1. Arrange to shut off utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
   3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
   4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
      a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
   1. Protect adjacent buildings and facilities from damage due to demolition activities.
   2. Protect existing site improvements, appurtenances, and landscaping to remain.
   3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
   4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
   6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
   7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
   2. Maintain fire watch during and for at least 24 hours after flame-cutting operations.
   3. Maintain adequate ventilation when using cutting torches.
   4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated on Drawings.

1. Doors and door hardware.
2. Windows.
3. Cabinets.
4. Mirrors.
5. Chalkboards.
6. Tackboards.
7. Marker boards.
8. Plumbing fixtures.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 24 inches below grade .

E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

F. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.

1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

G. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 41 16

SECTION 03 10 00 − CONCRETE FORMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in-place concrete including shoring, bracing and anchorage.
B. Openings for other Work.
C. Release agents and other related form accessories.
D. Form stripping.

1.2 RELATED SECTION

A. Section 03 20 00 - Concrete Reinforcement
B. Section 03 30 00 - Cast-In-Place Concrete

1.3 REFERENCES

A. American Concrete Institute (ACI):
   1. 347, Recommended Practice for Concrete Formwork.

1.4 DEFINITIONS

A. Concealed: For Work required under this Section, the term "concealed" will mean "not exposed to view in finished construction."
B. Exposed: For Work required under this Section, the term "exposed" will mean "exposed to view in finished construction."

1.5 QUALITY ASSURANCE

A. Grading Rules. Rules of the following associations apply to materials furnished under this Section:
   1. Southern Pine Inspection Bureau (SPIB).
   2. Western Wood Products Association (WWPA).
B. Tolerances: Follow ACI 301 (Table 4.3.1).

1.6 DELIVERY, STORAGE AND HANDLING

A. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.7 DESIGN CRITERIA

A. Design, engineering, fabrication, erection, maintenance and removal of formwork shall be responsibility of Contractor.
B. Construct forms following ACI 318, ACI 347, OSHA, state and local requirements.
C. Provide forms with sufficient strength to withstand pressures resulting from concrete placement and vibration.
D. Responsibility for properly bracing and shoring to support subsequent construction loads rests solely with Contractor.
E. Responsibility for removal of forms at any time before concrete has obtained certified specified design strength rests solely with Contractor.
F. The Engineer’s efforts are aimed at designing a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job Site safety during construction which are exclusively Contractor's responsibility. Processing and/or approving submittals made by Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed must not be construed as voluntary assumption by Engineer of any responsibility for safety procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS / PRODUCTS

A. Use forms specified in the general notes of the structural drawings. Provide in largest practical sizes to minimize number of required joints.

2.2 MATERIALS

A. Wood Form Materials:
   1. Reference general structural notes in sheet S1.1 for wood grade requirements.
B. Preformed Steel Forms: Minimum 16 gauge (0.06"/1.5mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
C. Form Release Agent: Colorless chemical form coating or mineral oil which will not stain concrete or absorb moisture.
D. Form Ties: Standard coil or snap galvanized adjustable ties with 3/4" diameter plastic cones on exposed surfaces. Provide manufacturer's recessed plugs of gray plastic or concrete to seal tie holes.
E. Nails, Spikes, Lag Bolts, Through Bolts and Anchorages: Sizes required; of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork.

B. Verify that dimensions agree with drawings.

3.2 ERECTION / INSTALLATION / APPLICATION

A. Follow ACI 301 and 347.

B. Provide forms as follows:

1. Concealed Surfaces: Rough or board form finish left by clean, straight formed lumber.
2. Exposed Surfaces (Typical): Hardboard or plywood lined concrete forms.

C. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over-stressing by construction loads.

D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.

E. Align joints and make watertight. Keep form joints to minimum.

F. Obtain approval before framing openings in structural members which are not shown.

G. Provide 1" chamfer strips in exposed exterior corners of beams, girders, columns, walls or foundation forms, around tops of all foundation slabs and elsewhere shown.

H. Provide temporary ports or openings in formwork required for cleaning out debris, adjusting reinforcing steel and to facilitate inspection.

I. Coordinate with Work of other Sections which require attachment of components to formwork.

J. Coat forms with non-staining form release agent. No other coating will be permitted unless specifically approved by Architect.

K. Inserts, Embedded Parts and Openings:

1. Provide formed openings required for items to be embedded in or passing through concrete Work.
2. Locate and set in place items which will be cast directly into concrete.
3. Coordinate with Work of other Sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, collars, thimbles, ties, sockets, nailing blocks, other inserts and components of other Work.
4. Obtain required setting information before proceeding.

L. Install accessories following manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.

M. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
2. Loosen forms carefully. Do not wedge pry bars, hammers or tools against exposed concrete surfaces.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

N. Do not construct any masonry walls on concrete floors or walls until concrete has attained its design strength and forms and shoring have been removed.

O. Terminate embedded form ties 1-1/2" from formed face of concrete. Construct ties so that ends and fasteners can be removed without causing spalling of face of concrete.

P. Repair form tie holes as follows:

1. Below Grade Surfaces: Fill tie holes with waterproof bituminous mastic to prevent water infiltration.
2. Above Grade Surfaces - Concealed: Fill tie holes with compatible materials flush with adjacent concrete.
3. Above Grade Surfaces - Exposed: Fill tie holes with compatible materials flush with adjacent concrete. Repairs shall blend in inconspicuously with surrounding surfaces. Follow Section 03 30 00.

Q. Finishes. Follow ACI 301 unless specifically shown otherwise.

3.3 TOLERANCES

A. Formwork: Follow ACI 301.

3.4 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring and bracing to ensure that Work follows formwork design and that supports, fastenings, wedges, ties and items are secure.

3.5 ADJUSTING AND 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.

END OF SECTION 03 10 00

CONCRETE FORMWORK (CIVIL SITEWORK)
SECTION 03 10 01

PART 1 - GENERAL

1.1 SCOPE:

A. This specification shall govern for all work necessary for designing, providing and installing concrete forms for any concrete structure (including curb and gutter, inlets, sidewalk and driveways) required to complete the project. With the exception of slabs, flatwork, and curb and gutter, concrete form work systems shall be designed for a minimum rate of concrete placement in the forms of ten (10) vertical feet per hour. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 - PRODUCTS:

2.1 WOOD FORMS:

A. Form lumber shall be seasoned, of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay or other imperfections which would affect its strength or impair the finished surface of the concrete. Lumber used for facing or sheathing shall be surfaced on at least one side and two edges. All exposed concrete edges shall be chamfered. Molding used for chamfer strips shall be of redwood, cypress or pine of quality that will not split when nailed and which can be maintained to true lines. Chamfer strips to pre-determined elevations just prior to placing final lift.

2.2 STEEL FORMS:

A. Metal forms shall provide a smooth straight surface and shall line up properly. Rivets and bolt heads in contact with concrete will be countersunk, level with surrounding surface. Metal surfaces in contact with concrete will be free from rust, paint or other foreign material that will disfigure or discolor concrete. Mount chamfer strip by Engineer approved methods and maintain as to grade and alignment.

2.3 FORM LINING:

A. Surfaces to be given a rubbed finish are to have form surfaces or form lining surfaces free of irregularities. Lining is to be of plywood made with waterproof adhesive, of 1/4 inch minimum thickness, preferably oiled at the mill and then re-oiled or lacquered on the job before using. An alternate to the plywood lining is tempered masonite concrete form presswood having a minimum 3/16 inch thickness. Keep presswood moist at least 12 hours before applying to sheathing. Use smooth hard face as concrete contact surface. Facing may be constructed of 3/4 inch plywood made with waterproof adhesive, backed by adequate studs and wales; and, in this case, form lining will not be required. Carefully align edges and faces of adjacent panels.

2.4 FORM TIES:

A. Form ties shall be threaded rod or coil tie type designed and of such length to provide a cone shaped formed "setback" of 3/4" on each wall face. After removal of forms, the cone shaped void shall be grouted. <u>All form ties shall incorporate a waterstop manufactured as an integral feature of the tie</u>. Form ties shall be part of the form system design and shall be adequate for all aspects of said system including a minimum rate of concrete placement in the forms of ten (10) vertical feet per hour. The use of wire ties, "snap ties" or similar products will not be permitted, except that Engineer will consider Contractor proposals to utilize such products on a case by case basis.

Temporary form spreaders will be removed as concrete is placed. Engineer will consider details of permanent form spreaders that Contractor may propose to use.

PART 3 - EXECUTION:

3.1 FALSEWORK:

A. Falsework shall be of rigid construction to prevent excessive settlement or deformation under imposed loading and to insure the safety of the workmen and the structure. Only sound timber shall be used for falsework. Falsework shall be designed using 150 pounds per square foot of horizontal surface of form.

3.2 FORMS - GENERAL:

A. Forms are to be constructed and placed in such a manner as to insure mortar tightness, rigidity to prevent excessive settlement or deformation under imposed loading and to insure the safety of the workmen and the structure. Forms shall be constructed in such a manner as to allow cleanout before placing of concrete; adequate access by tremies and vibrators; and removal without damage to concrete. Adequate cleanout openings shall be provided as directed by the Engineer. If excessive settlement or deformation occur, remove the concrete and steel, reset forms, replace the steel and pour fresh concrete. If existing steel is to be reused, Section 03 20 01 (2.6) must be met.

3.3 FORMS - CURB AND GUTTER, SIDEWALKS AND DRIVEWAYS:

A. Form shall be straight durable and have a depth equal to the required concrete depth; they shall be securely staked to line and grade in such manner that there will be no movement when the concrete is placed.

3.4 FORMS - DESIGN:

A. Forms shall be designed for a fluid pressure of 150 pounds per cubic foot and a live load of 50 pounds per square foot on horizontal surfaces with maximum unit stress of 125% of allowable stresses.

3.5 OILING FORMS:

A. All surfaces of forms that will be in contact with concrete will be treated with an approved form oil before concrete is placed. The Contractor shall apply form oil in such a manner so as to insure that no excess oil accumulates on the reinforcing or previously placed concrete. Immediately prior to placing concrete, the Contractor shall wet forms which will come in contact with concrete.

3.6 REMOVAL OF FORMS FROM SURFACES TO BE RUBBED:

A. Forms shall be removed when concrete has attained adequate strength to prevent damage and only as rapidly as rubbing operation progresses. Forms left in place longer than 24 hours will be rewet to keep moist.

3.7 REMOVAL OF FORMS AND FALSEWORK FROM SURFACES NOT TO BE RUBBED:

A. Forms and falsework shall be removed after concrete has aged the following number of curing days.
   a. Slabs, Beams, or Girders - 7 curing days.
   b. Walls, Columns and Piers - 2 curing days.

3.8 SETTING FORMS OR FALSEWORK ON SUBSTRUCTURES:

A. Forms or falsework shall not be erected on a concrete structure until the concrete in the substructure has cured at least four curing days.

3.9 SETTING FORMS OR FALSEWORK ON FOOTINGS:

A. Forms or falsework shall not be erected on a concrete footing until the concrete in the footing has cured at least 3 curing days.

3.10 CURING DAY:

A. A curing day is any calendar day on which the temperature near the structure is above 50 degree F for at least 19 hours.

END OF SECTION 03 10 01

CONCRETE STRUCTURES
SECTION 03 11 13

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to construct all structures required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Concrete shall have a minimum compressive strength of 3000 psi at 28 days (unless specifically specified otherwise) and shall be in accordance with Section 03 30 02 "Normal Weight Aggregate Concrete".

2.2 REINFORCING STEEL: See Section 03 20 01 "Concrete Reinforcement".

2.3 PREMOLDED EXPANSION JOINT FILLER

A. Premolded expansion joint filler shall conform to ASTM Specification D-544, Type I.

2.4 NON-SHRINKAGE GROUT

A. Shall be "Embeco 636" or "Masterflow 713" as manufactured by Master Builders Company, or "Ferrolith G" as manufactured by Sonneborn-Contech or approved equal.

2.5 WATERSTOPS

A. Waterstops shall be premolded polyvinyl chloride being "Durajoint" No. 5 as manufactured by Electrovert, Inc., or "Sealtight" No. 6380 as manufactured by W.R. Meadows, Inc., or "Synko-flex" plastic (Bitumen) continuous waterstop or approved equal unless otherwise designated on plans. The "Synko-flex" type water stop shall be used only in <u>horizontal</u> construction joints. The premolded PVC type water stop shall be used in vertical construction joints and may be used in horizontal construction joints (Contractor's option).

2.6 MEMBRANE CURING COMPOUND

A. Membrane curing compound shall be a resin base compound in accordance with ASTM Specification C-309, Type I, with light red tint of fugitive dye.

2.7 COTTON MATS FOR CURING

A. Cotton mats for curing shall be mats which uniformly contain a minimum of 3/4 pound of cotton per square yard, with Osnaburg covering cloth being a weight of not less than 6 ounces per square yard. The mats shall be a size which may be easily handled and having 6 inch wide flap for overlaps.

2.8 FLOOR HARDENER

A. Where drawings specify a floor hardener, liquid floor hardener shall be "Lapidoloth" as manufactured by Sonneborn-Contech, or "Kemplate" metallic surface hardener as manufactured by Chem-Masters Corp., or an approved equal.

2.9 INTEGRAL CONCRETE COLORING

A. Where drawings call for integral concrete coloring, "Sonobrite" as manufactured by Sonneborn-Contech, or "Staybrite" as manufactured by A.C. Horn Company, or an approved equal shall be used.

PART 3 – EXECUTION

3.1 REQUIRED APPROVAL

A. Prior to starting work, the Engineer may require the Contractor to furnish for approval any or all of the following:

a. Methods of construction.
b. Drawings for all form and falsework.
c. Amount and type of equipment to be used on the project.
d. The concrete placing schedule which take into account concrete shrinkage.
e. A schedule showing all surfaces to receive a rubbed finish.

The Engineer's approval of the above listed items does not relieve the Contractor of any responsibility for safety or correctness of methods, adequacy of equipment, or for carrying out work in accordance with his contractual obligations.

3.2 TIME SEQUENCE OF OPERATION

a. All substructure concrete work shall be cured for a minimum of four days before erecting forms or placing structural steel thereon.
b. All substructure concrete work shall cure for a minimum of 7 days before pouring superstructure concrete thereon.
c. All wall footings shall cure for a minimum of 3 days before placing wall forms thereon.
d. All superstructure shall cure for a minimum of 10 days before being used.

3.3 EXPANSION JOINTS

A. The Contractor shall remove forms as soon as possible to permit free expansion of concrete. Premolded expansion joint fillers shall be anchored to concrete on side of joint by means of copper wire No. 12 B and C gauge or heavier or copper nails of approved size. Concrete sections are to be completely separated by open joint or by joint material.

3.4 CONSTRUCTION JOINTS

A. General:
"Construction Joint" is defined as a contact surface between plastic concrete and concrete that has attained initial set. "Monolithic" means concrete placed without construction joints. Waterstops shall be provided in all construction joints in structures containing liquids up to a point one foot above the maximum water surface elevation and in all construction joints in structures with walls adjacent to soil, below a point one foot above the finished grade. The Contractor shall obtain written authorization of the Engineer to permit construction joints other than those indicated. Where such authorization is obtained, make additional construction joints with details and waterstops equivalent to those shown for similar joints.

B. Construction:
The Contractor shall leave surfaces rough with aggregate surface prior to placing of new concrete. Immediately prior to placing concrete on horizontal joint surfaces, slush surface with mortar coating. Mortar is to consist of regular concrete mix less coarse aggregate. On vertical surface, mortar is to brushed on and worked into irregularities on surface. Keyways are to be formed so as to permit easy removal of forms without damaging the concrete. Waterstops are to extend into both old and new pour an equal distance, or according to manufacturer's

recommendations as approved by the Engineer.

3.5 CONCRETE FORM WORK: See Section 03 10 01 - "Concrete Form Work".

3.6 PLACING REINFORCEMENT: See Section 03 20 01 - "Concrete Reinforcement".

3.7 SEAL SLABS

A. Seal slabs shall be placed in all excavations for structures which require reinforcing steel in base slab. Excavate below bottom of structural slab to the thickness shown on the drawings (min. 2 inches) and pour seal slab concrete to structural slab bottom elevation. Rough float finish seal slab. No direct payment will be made for seal slab concrete. Seal slab is not required for building on grade slab and grade beams unless shown otherwise on the drawings.

3.8 AUTHORIZATION TO PLACE CONCRETE

A. The Contractor shall notify the Engineer at least 48 hours in advance of a scheduled concrete placement. The Contractor shall not begin mixing concrete (or place an order for concrete) until the Engineer has inspected the forms, reinforcing steel, and given his approval. Before concrete is placed, all embedded items shall be accurately and securely fastened in place. The Contractor shall not place any concrete until he has at least three (3) mechanical vibrators, of an approved type, on the project site that are in good operating order.

3.9 SCHEDULING OF CONCRETE PLACEMENT

A. The Contractor shall schedule the concrete placement to insure completion during the hours of daylight. If it is necessary to continue pouring during hours of darkness, light the site in such a manner as to insure competent and safe operation. The Engineer can order postponement of placing operations when impending weather conditions threaten to impair the quality of the finished work. Should rainfall occur after placing operations have started, provide covering to protect work. If conditions occur which would be detrimental to placement and setting of concrete, such as pile driving or other vibration, stop the cause of such condition when concrete is being placed and until concrete has aged 12 hours.

3.10 HANDLING AND TRANSPORTING CONCRETE

A. The Contractor shall use metal or metal lined chutes, troughs, and/or pipes in placing concrete to prevent separation of concrete ingredients. When pouring down steep slopes, chutes shall be equipped with baffles to reverse lateral direction of movement. Downpipe shall be provided at end of chute. A maximum slope of one vertical to two horizontals shall be used. Chutes and troughs shall be kept free from coatings of hardened concrete or other harmful material. Chutes in excess of 35 feet in length may be used by authorization of the Engineer only. Pumping of concrete may be done by authorization of Engineer only.

3.11 PLACING CONCRETE

A. Free fall of concrete shall be limited to a maximum of 4 feet. The Contractor shall place concrete in walls and other inaccessible places by use of tremies. Concrete shall be placed as close as possible to its final location. Vibrators shall not be used to work concrete along the forms. Concrete, reinforcing steel or forms shall not be jarred, moved, or otherwise disturbed after concrete has taken initial set. Concrete shall be placed in continuous horizontal layers approximately 12 inches thick. Each successive layer shall be placed while the layer below is still plastic. If excessive water forms on the surface of the concrete, use concrete to a point approximately 1 foot below finish elevation and allow to settle. To avoid cold joint, resume placement of concrete after partial stiffening. Retempering of concrete or mortar which has partially hardened will not be permitted.

3.12 CONSOLIDATING CONCRETE

A. Consolidation of concrete shall be done by means of spading implements and mechanical vibrators of approved type. Use of vibrators of the type which operate by attachment to forms shall be by authorization of the Engineer only. Vibration of concrete shall begin immediately after placement and shall go completely through to next layer below to insure mixture of both layers. Vibration shall not be used for flowing concrete laterally.

3.13 PLACING CONCRETE ON THE GROUND

A. The Contractor shall prepare the subgrade in accordance with the applicable earthwork specifications. Apply membrane waterproofing if called for on the drawings and/or specified elsewhere. If membrane waterproofing is not required, moisten subgrade just prior to placing concrete, to decrease absorption of moisture from the concrete. If necessary, pump or bail during placing operations from suitable sump located outside of forms. Pumping will be continued until concrete has attained initial set. Side forms may be omitted when authorized by the Engineer.

3.14 PLACING CONCRETE IN WATER

A. The Contractor shall place concrete in water only by specific authorization of the Engineer. Concrete placed in or under water will contain a minimum of 6-1/2 sacks of cement per cubic yard of concrete. The Contractor shall insure that there is no movement or flow of water in which concrete is being placed for at least 36 hours after placement. Do not disturb concrete after placement and maintain approximately horizontal surfaces at all times. Placement will be by use of watertight tremies of a maximum of 10 inches in diameter. When concrete is placed in tremies, raise tremie slightly, but not out of concrete until batch discharges to bottom of hopper. Stop flow by lowering tremie. Placement will be continuous.

3.15 CURING CONCRETE

A. General:
The Contractor shall have the option of using curing compound or cotton mats with the exception of the following: Membrane curing compound shall not be used on surfaces to be rubbed, painted or to which waterproofing material or liquid floor hardener is to be applied. Membrane curing compound shall not be used on concrete which will have additional concrete placed on it later. Membrane curing shall be used for curing surfaces which cannot be satisfactorily cured with mats. Curing mats shall be kept moist and in contact with concrete for 7 consecutive days. High early strength concrete shall be cured for 3 consecutive curing days.

B. Use of Membrane Curing Compound:
Membrane curing compound shall be delivered on job site in original containers, labeled to show name of compound, manufacturer, and batch number. Compound shall be kept thoroughly mixed and sprayed on the structure using pressure-tank type spraying equipment. The Contractor shall apply curing compound to the concrete immediately upon removing forms at a rate of one gallon per 200 square feet. Apply compound to slabs or other exposed surfaces immediately after finishing or after excess moisture has disappeared. Membrane shall be kept intact and protected from abrasive action for 14 days to obtain equivalent to 7-day moist curing. Protect against traffic and apply protective coating no sooner than 24 hours after application of membrane. Damage to membrane during 14-day period shall be repaired immediately.

3.16 REMOVAL OF FORMS AND FALSEWORK: See Section 03 10 01 Concrete Form Work.

3.17 DEFECTIVE WORK

A. All work which is deemed by the Engineer to be defective will be repaired immediately by the Contractor in accordance with the Engineer's instructions.

3.18 MONOLITHIC SLAB FINISH

A. Unless otherwise specified, slabs, platforms, and steps shall be finished monolithically. Unless otherwise specified, slabs **shall** be level. The Contractor shall place screeds accurately and rigidly prior to placement of concrete. Concrete shall be tamped to force coarse aggregate away from surface; then float finish and steel trowel to finish building floors. "Dusting" of floor surfaces with dry materials **shall** not be permitted. Edges of all expansion joints shall be rounded at all expansion joints with suitable jointing or edging tool.

3.19 CONCRETE FLOOR TOPPING AND FINISH

A. Where specified, concrete floor topping shall be applied by the Contractor to structural slabs after equipment has been set. Topping may be placed without Engineer's authorization. Structural slab will be broomed to expose aggregate when concrete is green. Structural slab will be cleaned and kept moist 12 hours prior to placing topping. Immediately before placing concrete topping, broom in slush coat of cement and water mixed to consistency of thick paint. Use 1 part Portland Cement, 1 part sand, and 1-1/2 parts pea gravel for concrete topping. Use no more than 5 gallons of water per sack of cement. Add 5 pounds of non-shrinking grout aggregate per sack of cement in mix. Steel trowel finish will be provided. If specified, the Contractor shall apply liquid floor hardener in accordance with manufacturer's recommendations. If specified, the Contractor shall apply integral concrete coloring in accordance with manufacturer's recommendations.

3.20 FILLINGFOR TIE AND BOLT HOLES

A. The Contractor shall fill holes solid with cement mortar. Add white cement to mortar so that patches will not appear darker than adjacent concrete surface. Mortar shall be placed into holes as dry as possible. Holes passing entirely through concrete shall be filled from inside of structure with pressure gun or other device that will force mortar through to outside face. Strike off excess mortar flush with surface and finish to make hole as inconspicuous as possible.

3.21 PATCHING

A. Slight honey-comb and other minor defects in concrete surfaces **shall** be patched with cement mortar mixed 1 part cement to 2 parts fine aggregate. The Contractor shall repair by cutting out unsatisfactory material and replacing it with new concrete, securely keyed and bonded to old concrete and finish so as to make joints as inconspicuous as possible. Mixture shall be as stiff and dry as possible. For hydraulic structures, repair areas in which honeycomb occurs to prohibit leakage through concrete, using mortar to which non-shrinking grout aggregate has been added at the rate of 5 pounds per sack of cement.

3.22 RUB-FINISH SURFACES

A. Extent Required:
Exposed vertical and battered surfaces shall be rub-finished from 6 inches below surface or from below water level to the top, except for small structures which extend 12 inches or less above finished grade.

B. Procedure:
The Contractor shall start the rubbing operations immediately after form removal. Do necessary pointing as forms are removed. Remove forms only as rubbing progresses in No. 16 Carborundum Stone or equal. Rub sufficiently to bring to surface paste and to produce smooth dense surface without irregularities. Add no cement to form surface paste. Spread or brush material which has been ground to paste uniformly over surface and allow to take reset. Do not rub chamfered corners in first surface rubbing. First rubbing shall be completed within 36 hours after completion of concrete placement. In preparation for final finish, rub with No. 30 Carborundum Stone or equal. After rubbing, strip surface with brush and allow mortar on surface

to take reset; then wash surface with clean water. Leave structure with clean, neat, and uniform appearing finish.

3.23 ROUGH FINISH

A. For concrete having no special finish indicated, remove ties, fill holes, and remove fins and rough edges.

3.24 WATERSTOPS

A. Waterstop material will be completely embedded in concrete and shall extend an equal distance into both the old and the new concrete. Waterstops shall be continuous. Splices will be made in accordance with manufacturer's recommendations and approved by the Engineer.

3.25 GROUTING

A. Mixture:

The Contractor shall mix grout (proportion by weight) as follows:

(1) For Setting New Equipment: Where clearance is 1 inch or less in thickness, the Contractor shall use 1 part Portland Cement, 1 part clean sharp sand, 7/10 part non-shrinking grout aggregate. No more than 5-1/2 gallons water per sack of cement. Where clearance is over 1 inch in thickness, the Contractor shall use 1 part Portland Cement, 1 part clean sharp sand, and 1-1/2 parts 1/4 inch pea gravel, 7/10 part non-shrinking grout aggregate. No more than 6 gallons of water per sack of cement.

(2) Other: For general purpose grouting, the Contractor shall use 1 part Portland Cement and 2 parts sand. When space to be grouted is less than 1 inch, and it is impossible to tamp grout, use 1 to 1 mixture. Use stiff mixture for grout to be tamped. To obtain stiff grout mix mortar using amount of water required to thoroughly mix ingredients, then continue mixing without additional water until grout is stiff enough to be compacted by tamping when placed. For grouting blockouts for embedded pipes and similar items, use grout to which 5 pounds of non-shrinking grout aggregate per sack of cement has been added.

B. Procedure for Grouting Equipment:

The surfaces of foundations that are to receive grout shall be free of all laitance, grease, oil, organic matter and loose particles. Bolt holes shall be cleaned of all extraneous matter. Concrete shall be chipped in order to obtain a firmer bond as directed by the Engineer. Forms for the grout shall be set true, level, and tight, and shall be well braced. All equipment to be grouted shall be assembled at the grouting site before grouting operations begin. Base plates and items to be embedded shall be cleaned and set in their final positions prior to the start of grouting operations. All equipment shall be so shimmed as to facilitate the removal of the shims. Shims shall be removed only after the grout has attained its full strength. The areas to receive grout shall be kept wet for a minimum of 12 hours prior to grouting. Neat cement mortar slush coat shall applied with a stiff brush, and shall be scrubbed into the concrete foundation and applied to the sides and bottom of the base plate or other item to be set. The mortar shall be thoroughly mixed and an excess of water in the mixture shall be avoided. The grout shall be continuously worked and rodded while it is being placed in the forms. All grout destroyed in the removal of shims shall be replaced with grout of the exact same composition and consistency. All grout containing non-shrinkage grout aggregate shall be cut off vertically below the outside edge of the base plate or the base of the embedded equipment, and normal cement mortar shall be used to cover the edge of the grout. All exposed surfaces of the grout shall be steel troweled. All exposed areas shall be protected against rapid drying out. Items embedded in grout shall not be stressed. The machinery embedded in the grout shall not be operated for 36 hours.

END OF SECTION 03 11 13

SECTION 03 20 00 − CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel, welded wire fabric, tie wires and other related accessories.

B. Work includes reinforcing for interior and exterior cast-in-place concrete and reinforced concrete unit masonry Work.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 04 20 00 - Unit Masonry

1.3 REFERENCES

A. American Concrete Institute (ACI):

1. 301, Structural Concrete.
2. 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
3. 318, Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM):

1. A82, Cold Drawn Steel Wire for Concrete Reinforcement.
2. A185, Welded Steel Wire Fabric for Concrete Reinforcement.
3. A615, Deformed and Plain Billet Steel Bars for Concrete Reinforcement (including supplementary requirements)

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Practice.
2. 63, Recommended Practice For Placing Reinforcing Bars.
3. 65, Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.4 SUBMITTALS

A. Submit:

1. Shop drawings. Provide electronic (PDF) copies of each drawing.
   a. Show reinforcing steel and wire fabric sizes, spacings, locations and quantities, bending and cutting schedules and supporting and spacing devices.
   b. Indicate visual method of identification of bar strengths following ASTM standard for steel type used.
2. Certified copies of mill test reports of reinforcement materials analysis (upon request).

B. Provide submittals within 30 days after Contract date.

1.5 QUALITY ASSURANCE

A. Maintain 1 copy of each referenced document at Site.

B. Fabrication and Placement Tolerances: Follow ACI 301.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver to Site free of rust and scale, clearly marked as to bar strength.

B. Store reinforcing materials on pallets or other materials off ground. Avoid surface contamination before placement and prevent bending or warping.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel: ASTM A615, Grade 60 (60,000 psi yield strength) billet steel bars; unfinished. Provide in sizes shown on plans provide deformed bars typically and plain bars where dowels are shown.

B. Stirrup Steel: #3 reinforcing bars may by ASTM A615 Grade 40.

C. Welded Wire Fabric (WWF): ASTM A185, plain type; unfinished. Provide in sheet form not in rolls. Provide as sized if shown or as follows if not shown:

1. Provide 1 layer of 6 x 6-W2.9 x W2.9 in sidewalk and toppings 4" or less in thickness.

2.2 ACCESSORIES

A. Tie Wire: Minimum 16 gauge (0.06") annealed type.

B. Chairs, Bolsters, Bar Supports and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports and Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless steel type; sizes and shapes required.

2.3 FABRICATION

A. Fabrication: Follow CRSI Manual of Practice.

B. Locate reinforcing splices not shown at points of minimum stress.

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundations and Footings:

1. Clean excavations of loose debris, earth. Cut sides of excavations square, remove loose material.
2. Pump out standing water from excavations before placing reinforcement. Remove and replace mud or frozen soil with lean concrete.

B. Clean reinforcement completely before concrete placing. Reinforcement shall be free from loose, flaky rust, mud, oil or other coatings that would destroy or reduce bond with concrete at time concrete is placed. Reinspect reinforcement and clean off any dried cement, mortar or dirt when placement is delayed.

C. Obtain Owner's Engineer's approval of reinforcement installations prior to placement of any concrete.

3.2 ERECTION / INSTALLATION / APPLICATION

A. Position reinforcement following ACI 301, ACI 315 and drawn details.

B. Provide reinforcing steel in concrete footings, foundation walls, thickened slabs, retaining walls and elsewhere shown.

C. Provide reinforcing steel in concrete unit masonry walls, bond beams and elsewhere shown.

D. Provide corner reinforcing steel in footings at corners and at intersections of walls unless shown otherwise:
   1. Bar size and spacing shall match wall or footing reinforcing.
   2. Return bars minimum of 36 diameters on each end.
   3. WELDING OF REINFORCING IS NOT PERMITTED.

E. Provide the following minimum concrete cover requirements for reinforcing steel unless shown otherwise:
   1. Concrete Cast Against and Permanently Exposed to Earth: 3".
   2. Concrete Exposed to Earth or Weather:
      a. #5 Bars and Smaller: 1-1/2".
      b. Others: 2".

F. Provide minimum splice requirements for reinforcing steel shown or required by ACI 318. Stagger splices so that no more than 1/2 of horizontal reinforcing steel is spliced at any given cross section.

G. Provide a bond breaker such as plastic sleeves at all dowel bars occurring at control and expansion joints.

H. Place, support and secure reinforcement against displacement. Do not deviate from required position.
   1. Provide bolsters and chairs required to maintain reinforcing steel at proper elevation in slab.

I. Lap welded wire fabric minimum 6" or 1 full mesh on sides and 1 foot or 2 full meshes on ends and extend to within 2" of slab edges. Chair support welded wire fabric so that welded wire fabric is in upper half of slab while placing slabs on grade unless specifically shown otherwise.

J. Carry welded wire fabric and reinforcing steel through control (contraction) joints but not through construction and expansion joints unless shown otherwise.
   1. Grease dowels thoroughly and paper wrap to allow for horizontal movement at expansion joints.
   2. Cut alternate wires of welded wire fabric at control joints.

K. Take care to avoid disturbing reinforcement and vapor retarder during placing of concrete. Remove and reinstall disturbed or improperly installed reinforcement when discovered or instructed by Owner's Engineer before continuing concrete placement.

L. Accommodate placement of formed openings.

END OF SECTION 03 20 00

CONCRETE REINFORCEMENT (CIVIL SITEWORK)
SECTION 03 20 01

PART 1 - GENERAL

1.1 SCOPE

A. This specifications shall govern for all work necessary for furnishing reinforcing steel, bar supports, welding, tools, supplies, equipment and services, and placing of concrete reinforcement of the shape and dimensions shown on the contract drawings, and as called for by these specifications required to complete the project.

PART 2 - PRODUCTS

2.1 REINFORCING STEEL

A. All reinforcing bars, except column, shall be deformed as defined in ASTM Specifications. All reinforcing bars, unless noted on the structural drawings, shall be Grade 60 as defined by the American Society for Testing and Materials. "Standard Specifications for Rail-Steel and Axie-Steel Deformed Bars for Concrete Reinforcement" (A615 A996). Spiral reinforcing steel shall be fabricated from cold drawn with (ASTM A106) or hot rolled plain or deformed bars conforming to ASTM A625, Grade 60. Welded smooth wire fabric shall conform to ASTM A1064 "Welded Steel Wire Fabric for Concrete Reinforcement" (ACI 318 limits the wire spacing to 12 inches maximum). Welded deformed wire fabric shall conform to ASTM A1064 "Welded Deformed Steel Wire Fabric for Concrete Reinforcement" (ACI 318-71 limits the wire spacing to 16 inches max.).

2.2 TIE WIRE

A. The tie wire used shall be black annealed wire, 16 gauge or heavier.

2.3 REINFORCING BAR SUPPORTS

A. Bar supports shall conform to the "Bar Supports Specifications" contained in "Manual of Standard Practice", as published by the Concrete Reinforcing Steel Institute and the Western Concrete Reinforcing Steel Institute. The Contractor shall provide such accessories as plastic spacers, plastic bar supports (chairs), and other approved devices necessary for proper assembly, spacing and supporting the reinforcing steel.

2.4 REINFORCEMENT ACCESSORIES

A. All accessories for reinforcement spacing and support shall be the size and type to accurately conform to the required spacing and concrete clear cover as shown on Construction Drawings.

2.5 MILL CERTIFICATES

A. Two certified copies of mill tests on each grade of reinforcing steel delivered showing physical and chemical analysis shall be provided, upon request, at the time of shipment.

2.6 SURFACE CONDITION

A. Metal reinforcement at the time concrete is placed shall be free from mud, oil, or other non-metallic coatings that adversely affect bonding capacity. Metal reinforcement, except pre-stressing steel, with rust, mill scale, or a combination of both shall be considered as satisfactory, provided the minimum dimensions, including height of deformations and weight

of a hand wire brushed test specimen, are not less than the applicable ASTM specification requirements.

2.7 REINFORCING STEEL OF FOREIGN MANUFACTURER

A. No reinforcing steel of foreign manufacture shall be allowed on the project site. Any foreign steel accidentally delivered to the project site must be removed immediately.

PART 3 EXECUTION:

3.1 STORAGE

A. The Contractor shall store all reinforcement above the surface of the ground on platforms, skids or other suitable supports.

3.2 PROTECTION

A. The Contractor shall protect all reinforcement from mechanical injury, from surface deterioration caused by exposure to conditions producing rust, and from non-metallic coatings that adversely affect bonding capacity.

3.3 STANDARD PRACTICE

A. All requirements of concrete reinforcement not covered in these specifications or on the structural drawings shall be in accordance with "Manual of Standard Practice", as published by the Concrete Reinforcing Steel Institute and the Western Concrete Reinforcing Steel Institute. All hooks shall conform to bend dimensions defined as "ACI Standard Hooks" in "Manual of Standard Practice", as published by the Concrete Reinforcing Steel Institute and the Western Concrete Reinforcing Steel Institute, unless otherwise shown on the structural drawings. All reinforcing bars shall be bent cold. Reinforcing bars shall not be bent or straightened in a manner that will injure the material. Reinforcing bars shall conform accurately to the dimensions shown on the structural drawings and within the fabricating tolerances shown in "Manual of Standard Practice", as published by the Concrete Reinforcing Steel Institute and the Western Concrete Reinforcing Steel Institute.

3.4 PLACING REINFORCING STEEL

A. The placement of bars should conform to the recommended practices in "Placing Reinforcing Bars", as published by the Concrete Reinforcing Steel Institute. Bars should be securely tied to prevent displacement during the concreting operation and all dowels must be wired in place before depositing concrete. All splicing of bars, concrete cover, placing tolerances and bar spacing shall conform to "Building Code Requirements for Structural Concrete" (ACI318), as published by the American Concrete Institute, and to recommended practices in "Reinforcing Bar Splices" by the Concrete Reinforcing Steel Institute. All reinforcing steel splices shall be Class C, unless shown otherwise on the drawings.

3.5 SHOP DRAWINGS

A. The Contractor shall furnish, 6 copies of the placing drawings and bar lists in accordance with the latest revision of "Manual of Standard Practice for Detailing Concrete Structures" (ACI315), as published by the American Concrete Institute. Reinforcing steel shall not be fabricated until shop drawings have been approved by the Engineer.

END OF SECTION 03 20 01

SECTION 03 30 00 − CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior and exterior plain and reinforced site-placed concrete, vapor retarders, expansion joints, curing compounds and other related accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Masonry Wall Dowels

1.3 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcement

B. Section 04 20 00 – Unit Masonry

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. 301, Structural Concrete.
2. 302, Guide for Concrete Floor and Slab Construction.
3. 304, Measuring, Mixing, Transporting and Placing Concrete.
4. 305R, Hot Weather Concreting.
5. 308, Curing Concrete.
6. 309, Recommended Practice for Consolidation of Concrete.
7. 318, Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM):

1. C31, Making and Curing Concrete Test Specimens in the Field.
2. C33, Concrete Aggregates.
3. C39, Compressive Strength of Cylindrical Concrete Specimens.
4. C94, Ready Mixed Concrete.
5. C143, Test Method for Slump of Portland Cement Concrete.
6. C150, Portland Cement.
7. C171, Sheet Materials for Curing Concrete.
8. C172, Sampling Freshly Mixed Concrete.
9. C231, Air Content of Freshly Mixed Concrete by the Pressure Method.
10. C260, Air Entraining Admixtures for Concrete.
11. C309, Liquid Membrane - Forming Compounds for Curing Concrete.
12. C494, Chemical Admixtures for Concrete.
13. C618, Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.5 DEFINITIONS

A. Concealed: For Work required under this Section, the term "concealed" will mean "not exposed to view in finished construction."

B. Exposed: For Work required under this Section, the term "exposed" will mean "exposed to view in finished construction."

1.6 SUBMITTALS

A. Submit: Provide electronic (PDF) copies of all required submittal information.

1. Concrete mix designs. Follow ACI 301. Submit a mix design for each class of concrete required within 30 days after Contract date and prior to placing any concrete.
2. Product data including installation requirements for curing/sealer compounds, mineral and chemical admixtures and joint devices.
3. Concrete delivery tickets.
    a. Submit to Owner's Engineer at Site.
    b. Follow ASTM C94. Also include:
        1) Batch number.
        2) Mix by class of concrete and bag content with maximum aggregate size used
        3) Air content.
        4) Quantities and types of admixtures.
        5) Slump.
        6) Time of loading.
    c. Delivery tickets not showing time of loading will be grounds for rejection of load.
4. Testing laboratory reports.
    a. Submit directly to Owner's Engineer, Contractor and ready-mix supplier.
5. Certification or test results indicating compliance of material or source of material with these specifications (upon request).

1.7 QUALITY ASSURANCE

A. Maintain 1 copy of each referenced document at Site.

B. Acquire cement and aggregate from same source for all Work.
C. Tolerances: Place and finish cast-in-place concrete within tolerance limits specified in ACI 301 and as follows:
   1. Formed Surfaces: Follow ACI 301 (Table 4.3.1.)
D. Acceptance of Work: Presence or evidence of nonconforming Work shall be sufficient cause for Owner's Engineer to require entire section of concrete affected be torn out and rebuilt properly at Contractor's expense.
   1. Such unacceptable Work includes:
      a. Horizontal or vertical misalignment.
      b. Cracking.
      c. Honeycombing.
      d. Spalling.
      e. Embedded debris.
   2. If by tests or on-site observation, Owner's Engineer determines that any of Contract requirements have not been fully met in completion of this Work, he may require additional testing or retesting to determine composition, soundness and actual structural capacity of any concrete.
   3. Costs for such testing shall be paid by Contractor if such tests subsequently establish that Work is unacceptable and by Owner if Work is found to be acceptable.
   4. Remove and replace all unacceptable Work including related Work which was acceptable but which must be disturbed as a result of replacement if such tests establish that Work is unacceptable with regard to compliance with these specifications.

1.8 DELIVERY, STORAGE AND HANDLING
A. Concrete Delivery: Follow ACI 304 and ASTM C94.
B. Deliver packaged materials in manufacturer's unopened, labeled containers.
C. Store materials to provide protection from weather and damage.
D. Deliver concrete in agitating or revolving type equipment. DO NOT USE NON-AGITATING EQUIPMENT.
E. Discharge concrete at Site within 1-1/2 hours or 300 revolutions, whichever comes first, after water has been added to cement and aggregates or cement batches with aggregates unless a longer time is specifically authorized by Owner's Engineer.
F. Owner's Engineer may require a reduction in this elapsed time during hot weather, when high early strength cement is being used or under other conditions contributing to quick stiffening of concrete.

1.9 PROJECT CONDITIONS
A. Coordinate Work of other trades who will furnish and install items of Work (sleeves, piping, conduit, inserts, etc.) to be cast in concrete. Place no concrete until such items are in place.
B. Place concrete at ambient temperatures between 50°F and 95°F.
C. Follow instructions for special procedures at end of this Section should it be necessary to place concrete in colder or hotter weather.
D. Protect freshly placed concrete from rainfall, water leaks, falling objects, traffic of any kind and other hazards to surfaces. Provide barricades and lights if necessary.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Portland Cement:
   1. ASTM C150 Type I (Normal) or Type II (Moderate).
   2. Cement shall be free of false set when tested following ASTM C451.
   3. Use same brand, type and source throughout.
B. Aggregates:
   1. Fine Aggregate: ASTM C33; natural or manufactured sand, clean, hard and durable, uncoated grains, free from deleterious matter. Average fineness modulus shall be between 2.5 and 3.0.
   2. Coarse Aggregate: ACI 301 and ASTM C33.
      a. Interior and Concealed Exterior Applications: Crushed gravel or stone, durable uncoated particles free from deleterious matter.
      b. Exposed Exterior Applications: Crushed dolomite, granite or limestone.
      c. Grading: ASTM C33 No. 57. Exception: Use grade size No. 8 masonry core fill.
C. Admixtures:
   1. Mineral Admixtures:
      a. Fly Ash: ASTM C618 Class C; maximum 25% fly ash may be used as a cement substitute; maximum 6% loss on ignition.
      b. Fly ash source must be approved by Owner’s Engineer. Preapproved sources are:
         1) Class C: Boral Manufacturing
   2. Chemical Admixtures:
      a. Air Entraining Admixtures: ASTM C260.

b. Water Reducing Admixtures: ASTM C494 Type A (Water Reducing).
1) Type E (Water Reducing and Accelerating) may be used during cold weather and Type D (Water Reducing and Retarding) during hot weather with Engineer's prior approval.
2) Type F (Water Reducing - High Range) or Type G (Water Reducing High Range and Retarding) admixtures (superplasticizers) may used be used with Engineer's prior approval.
c. Calcium chloride, thiocyanates, corrosive admixtures or admixtures containing more than 0.05% chloride ions (total) are not permitted.

3. DO NOT USE ANY OTHER ADMIXTURES WITHOUT AEPSC'S PRIOR WRITTEN APPROVAL.

D. Water: Potable; free from objectionable quantities of foreign materials harmful to concrete such as silt, organic matter, acids, alkali, salt and other deleterious substances.

E. Vapor Retarders: Sheet Vapor Retarder ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Basis-of-Design Product: Xtreme 10 mil by Tex-Trude LP, 281-452-5961(www.tex-trude.com) or approved equivalent product by one of the following:
a. Fortifiber Building Systems Group.
b. Grace Construction Products; W.R. Grace & Co. -- Conn.
c. Insulation Solutions, Inc.
d. Poly-America, L.P.
e. Raven Industries, Inc.
f. Reef Industries, Inc.
g. Stego Industries, LLC.
h. W.R. Meadows, Inc.

F. Seam Tape: Xtreme Thin Tape, Xtreme Seam Tape or Xtreme GripBack Tape by Tex-Trude LP, 281-452-5961 (www.tex-trude.com), or seam tape compatible with approved equivalent vapor retarder.

G. Expansion Joint Filler Strips: ASTM D1751 non-extruding and resilient type, asphalt impregnated fiberboard or felt or ASTM D1752 closed cell foam with resiliency recovery of 95% if not compressed more than 50% of original thickness; 3/8" thick for interior and 1/2" thick for exterior unless shown otherwise.

H. Liquid Curing/Sealer Compound (Typical): ASTM C309 Type 1; approved by Asphalt and Vinyl Composition Tile Institute; 30% minimum solids content.

I. Sheet Curing Membranes: ASTM C171; absorptive mats, waterproof paper or polyethylene film.

2.2 CONCRETE MIXES

A. General Requirements:
1. Concrete Mixing: Follow ASTM C94. BATCH MIXING OF CONCRETE ON SITE IS NOT PERMITTED EXCEPT FOR MISCELLANEOUS MIXES.
2. Mixing Procedures: Follow ACI 301.
3. Handling and Weighing: Follow ACI 304.
4. Measure water, air entraining admixtures and water reducing admixtures by weight or volume. Measure all other materials by weight.
5. Provide admixtures for entrainment in concrete Work subject to vehicle abrasion or freeze - thaw cycles either during construction or afterwards. AIR ENTRAINED CEMENT IS NOT ACCEPTABLE.
6. Provide water reducing admixtures in all Classes of concrete Work.
7. No dry-packaged mixtures are allowed.
8. Provide fly ash as supplementary cementitious material in concrete Work. Fly ash content shall not exceed 25% of the cementitious material weight within a concrete batch.
9. Exposed concrete is to meet requirements for potentially destructive exposure.
10. Admixtures are to be added at batch plant.
11. Do not add water to mix on job unless previously approved by Owner's Engineer. Note amount of water added on delivery ticket.
12. Nominal maximum allowable slump of concrete (except for controlled density fill) is 4".
13. Follow Exhibit 03 30 00 for water/cementitious ratio of concrete.
14. Provide minimum 3 day compressive strength of 1800 psi for concrete used for floors.

B. Concrete Properties and Proportions:
1. Provide concrete meeting the following properties and performance specifications

a. Drilled Pier Concrete (Class 1)

F'c	4,000 psi (28-day compressive strength)
Portland Cement	ASTM C 150 Type II
Fly Ash	ASTM C 618 Class C (Maximum of 25% of cementitous material)
Water/Cementitious Material Ratio	0.60 Maximum
Slump	7" (+/- 1") measured from the discharge of the truck
Coarse Aggregate	1" maximum with gradation requirements prescribed in Table 2 of ASTM C33 Size No. 57.
Air Entrainment	Air entrainment shall not be used for concrete with exposed steel troweled surfaces
Total Air Content	3% Maximum (by volume)
Concrete Temperature	95ºF Maximum

b. Cast-In-Place Concrete (Class 2)

F'c	4,000 psi (28-day compressive strength)
Portland Cement	ASTM C 150 Type II
Fly Ash	ASTM C 618 Class C (Maximum of 25% of cementitous material)
Water/Cementitious Material Ratio	0.60 Maximum
Slump	5" (+/- 1") measured from the discharge of the truck, for all concrete unless noted otherwise
Coarse Aggregate	1" maximum with gradation requirements prescribed in Table 2 of ASTM C33 Size No. 57
Air Entrainment	Air entrainment shall not be used for concrete with exposed steel troweled surfaces
Total Air Content	3% Maximum (by volume)
Concrete Temperature	95ºF Maximum

c. Masonry Grout Fill (Class 3)

F'c	3,000 psi (28-day compressive strength)
Portland Cement	ASTM C 150 Type II
Fly Ash	ASTM C 618 Class C (Maximum of 25% of cementitous material)
Slump	8" to 11" measured from the discharge of the truck
Coarse Aggregate	3/8" maximum with gradation requirements prescribed in Table 2 of ASTM C33 Size No. 8

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Site conditions and excavations for earth forms to verify that they are neatly and accurately cut and correctly located.

B. Examine formwork to verify that it is sound and correctly located, that conditions are proper for concrete installation and that excavations are sufficient to permit placement, inspection and removal of forms.

C. Examine reinforcement to verify requirements for concrete cover.

D. Examine areas of Work to be cast to determine that substrates are properly installed, required reinforcement, inserts and embedded items are in place and that correct finish top of cast elevations can be obtained.

1. Verify that conduit and piping is installed below slab. NO UTILITIES ARE TO BE BUILT INTO SLAB OR TOPPING.
2. Verify depths of depressed conditions are correct for specified delayed finishes. Slabs to receive finishes over 1/8" in thickness shall be depressed as required to allow for alignment with adjacent finish materials.
3. Verify base and sub-base slope correctly at floor drains. Slab thickness shall be maintained in sloped areas.

E. Do not start Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ensure availability of sufficient labor, equipment and materials to place concrete correctly following Project requirements and scheduled casting.

B. Notify Owner's Engineer at least 48 hours in advance of placing any concrete. Place concrete only when Owner's Engineer is present unless this requirement is specifically waived. Excavations must be inspected and approved by soils engineer.

C. Place no concrete before embedded items are in place and before forms, reinforcing and affected Work of other trades have been examined.
   1. Coordinate placement of joint devices with erection of formwork and placement of form accessories.

D. Drill holes in previously poured concrete, insert steel dowels and pack solid with non-shrink grout in locations where new concrete is dowelled to existing Work including at bases and pads.

E. Immediately Before Placing Concrete:
   1. Clean debris from forms, decks, base slabs, bottoms of forms, etc. to receive concrete.
   2. Thoroughly wet base of slabs poured directly on earth, sand, stone, concrete or gravel.
   3. Verify sizes and locations of openings required.
   4. Secure approval of conditions from Owner's Engineer. Allow a minimum of 1 hour for Owner's Engineer's inspection after installation of reinforcing and before placing concrete.

3.3 ERECTION / INSTALLATION /APPLICATION

A. Follow ACI 301.

B. Place concrete only when Owner's Engineer is present unless this requirement is specifically waived by Owner's Engineer upon notice of scheduled pour.

C. Notify Owner's Engineer not less than 48 hours (excluding holidays and weekends) in advance of placing concrete.

D. Provide concrete of following various classes unless shown otherwise.
   1. Class 1: Drilled Pier Concrete
   2. Class 2: Cast-In-Place Concrete
   3. Class 3: Masonry Grout Fill

E. Provide uniform slope at rate shown on structural foundation plans. Exterior walkways shall slope as indicated on Architectural plans.

F. Install vapor retarder under interior and exterior slabs, walks, bases and pads on grade.
   1. Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   2. Lay film directly on slab base just before setting reinforcing and pouring concrete slabs. Provide widest widths practical and oriented to obtain least lineal footage of joint.
   3. Lap and seal joints. Lap film a minimum of 6" at joints with top lap placed in direction of spreading of concrete. Seal joints watertight by taping or applying sealant at overlapping edges and ends.
   4. Carry film up walls, columns, etc. and secure in place with cement or tape. Fold and cement corners or otherwise make vaporproof.
   5. Provide sealed contact with piping and other penetrating items. Cut film carefully around opening for pipes, ducts, conduit, wiring, etc. Tape film to insure maximum barrier effectiveness.
   6. Exercise care so that film is not punctured. Seal joints, cuts, punctures, etc. with tape, cement or hot iron.
   7. Trim exposed film at floor line after concrete has cured and hardened.
   8. Repair vapor retarder damaged during placement of concrete reinforcing.

G. Provide sufficient workmen to allow for placement of concrete and other operations within time limits required in Article 1.07 herein.

H. Keep delivery carts and buggies on runways. Do not allow them to bear on reinforcing or uncured concrete.

I. Deposit concrete within 6 feet of its final location to avoid segregation due to rehandling or flowing. Do not drop concrete freely where reinforcing will cause segregation. Chuting procedure is subject to approval of Owner's Engineer. Maximum allowable drop is 5 feet. SPREADING WITH VIBRATORS IS PROHIBITED.

J. Place concrete quickly and vibrate thoroughly with a vibratory screed or other device approved by Owner's Engineer. Maintain specified position of mesh and reinforcement. Follow ACI 309 for use and type of vibrators.

K. Deposit concrete continuously, or when continuous placement is not possible, provide construction joints at locations approved by Owner's Engineer.

L. Do not deposit partially set concrete, retempered concrete or any concrete failing slump or air content tests.

M. Consolidate concrete by internal vibration to maximum practical density so that it is free from pockets of coarse aggregate and trapped air, fits tightly against subgrades, forms and embedded items and leaves smooth, dense surfaces.

N. Operate vibrators using experienced workers and where possible use same operators throughout Project. DO NOT USE VIBRATORS AGAINST FORMS OR REINFORCEMENT.

O. Finishes: Follow ACI 301 (Chapter 11). Perform finishing using only experienced, skilled workers.
   1. Flatwork:
      a. Slab finish shall be as noted on structural foundation plans. Reference structural general notes for flatness requirements pertaining to surface finish.
      b. Detectable Warning Finish: For exterior handicapped curb cuts (ramp only not on flared sides), textured or imprinted concrete using rollers or aluminum tools to produce 0.9" diameter x 0.2" high (nominal) truncated domes at 2.35" on center following requirements of Americans With Disabilities Act (ADA).
   2. Vertical and Miscellaneous Work:
      a. Exposed Surfaces: Smooth, Do Not Rub Cement Paste on Exposed Concrete Surfaces.
      b. Concealed Surfaces: Rough form finish.

P. Control (Contraction) Joints:
   1. General Requirements:
      a. Provide joints in walks, pads, slabs and toppings shown or specified.
      b. Make joints approximately 1/8" wide and minimum depth of 1/4 slab thickness.
      c. Locate as shown or as follows if not shown. Verify final locations with Owner's Engineer before proceeding.
   2. Interior Locations:
      a. Provide sawed control joints where shown or at maximum 20 feet on center in each direction in slabs and toppings if not shown.
      b. Install sawed joints immediately after final finishing to depth of 1/4 slab thickness with Soff-Cut saw.
      c. Saw control joints 1/8" wide unless otherwise approved. A construction joint may be located where sawed joint is required.

Q. Curing and Protection: Follow ACI 308.
   1. Prevent excessive moisture loss from formed surfaces. Cure formed surfaces by moist-curing or application of curing compound for remainder of curing period if forms are removed before 7 days have elapsed.
   2. Provide 1 application of liquid curing/sealer compound immediately after finishing of concrete on interior and exterior concrete slabs.
      a. Exception #1: Floors scheduled to receive ceramic tile and quarry tile shall be sheet membrane/water (moist) cured for minimum of 10 days.
         1) Begin water curing as soon as concrete has hardened sufficiently to prevent damage from water or cover material.
         2) Water curing shall consist of ponding or with sprinkling, spraying or covering with wet burlap, sand or waterproof barrier such as polyethylene or building paper.
         3) Maintain 100% coverage continuously over water cured slabs for minimum of 4 days for ponding and for 7 days for spraying and membrane curing.

3.4 FIELD QUALITY CONTROL

A. Test and inspect materials and operations as Work progresses. Failure to detect defective Work shall not prevent rejection when defect is discovered nor shall it obligate Owner for final acceptance.

B. Costs for any retesting resulting from Work found to be in non-compliance shall be paid for by Contractor.

C. Strength: ASTM C31, C39 and C172.
   1. Conduct strength tests of all classes of concrete (except miscellaneous mixes).
   2. Secure composite samples following ASTM C172. For strength tests, a sample shall be obtained from same batch of concrete on a representative, random basis. A sample consists of six specimens.
   3. Mold and cure each sample following ASTM C31.
   4. Test 1 specimen at 7 days, test 2 specimens at 28 days and 1 specimen at 56 days following ASTM C39. Results shall be average of strengths of 2 specimens, except that if 1 specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded.
   5. Record exact location of Work represented by each sample on test reports.
   6. Provide a sample for each amount or fraction thereof of each class of concrete placed each day as follows:
      a. 0-100 Cubic Yards: 1 Sampling of 4 Cylinders.

D. Air Content: ASTM C231.

E. Slump: ASTM C143.

3.5 ADJUSTING AND CLEANING

A. Provide materials, methods and finishes for cleaning, patching and other repairs consistent with similar concrete Work in place, approved by Owner's Engineer before beginning repair Work and performed at Contractor's expense.

B. Repair any slabs which do not meet finish requirements performing all grinding, filling of cracks or patching and leveling procedures as required. Replace slabs which cannot be successfully repaired.

C. Point carefully around piping, conduit and other penetrations on both interior and exterior surfaces.

D. Obtain Owner's Engineer prior approval of any corrective measures for slabs which are dusting or showing other signs of improper curing. These may include additional applications of sealer or hardener, grinding or covering with coating or topping.

E. Remove from interior and exterior exposed surfaces any stain-producing elements such as pyrites, nails, wire, reinforcing steel and form ties immediately prior to final acceptance.

F. Remove stains completely. Use of weak acids or patented cleaners is acceptable but surface is to be completely neutralized after use.

G. Blend in surfaces of exposed repairs inconspicuously with surrounding surfaces.

3.6 PROTECTION

A. Protect newly placed concrete from weather and construction traffic damage.

3.7 SPECIAL PROCEDURES

A. It is Project intent to continue concrete Work required to keep Project on schedule throughout summer and winter.

B. Hot Weather Concreting:

1. Follow ACI 305R.
2. Obtain approval to use a retarder in concrete.
3. Temperature of concrete shall not exceed 95^{o}F.
4. Cool water and aggregate to lower temperature of concrete.
5. Cool subgrade and forms by sprinklering with water immediately before placing.
6. Schedule trucks to reduce waiting time at Site.
7. Cure immediately after finishing.

C. Replace any concrete injured or destroyed by reason of freezing, hot or cold weather at Contractor's own expense including cost of replacing any Work embedded in concrete.

END OF SECTION 03 30 00

NORMAL WEIGHT AGGREGATE CONCRETE (CIVIL SITEWORK)
SECTION 03 30 02

PART 1 – GENERAL

1.1 SCOPE

A. This specification shall govern for all work necessary for providing all Portland Cement Concrete with normal weight coarse aggregate required to complete the project.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

A. Portland Cement shall conform to ASTM I-150 and shall be Type I. Other types of cement shall be used only when approved by the Engineer.

2.2 WATER

A. Water shall be reasonably clean and free from injurious amounts of oils, acid, salt, alkali, organic matter or other deleterious substances. Questionable water shall be tested by a testing laboratory in accordance with ASTM C-94. The cost of testing will be borne by the Contractor. Potable water need not be tested.

2.3 FINE AGGREGATE

A. Fine Aggregate shall consist of natural sand, or sand prepared from product obtained by crushing stone or gravel. Sampling of fine aggregate shall be in conformance with ASTM D-75. Sieve analysis shall be in accordance with ASTM C-136.

B. Fine aggregate shall conform to the following grading requirements:

Retained on 3/8" screen	0.0%
Retained on 1/4" screen	0 to 5.0%
Retained on 20 mesh sieve	15 to 50.0%
Retained on 100 mesh sieve	85 to 100.0%

Deleterious substances shall not be present in excess of following percentage by weight.

Material removed by decantation	3.0%
Clay Lumps	0.5%
Other substances such as coal, shale and friable particles	2.0%

C. Fine aggregate shall be of such quality that when made into mortar and tested in accordance with ASTM C-87 the mortar shall develop a compressive strength at 7 days and 28 days of not less than 95 percent of that developed by the mortar specified as the basis for comparison. Sand shall not contain organic impurities in amounts that, when the sand is tested in accordance with ASTM C-40, would cause it to show a color darker than the standard color. Fine aggregate shall have a fineness modulus conforming to the following:

All strength concrete	not less than 2.0
2,000 psi concrete and less	not more than 3.25
2,500 psi concrete and greater	not more than 3.50

D. The fineness modulus shall be determined by adding total percentages retained on the following U.S. Standard sieves and dividing by 100:
3 in., 1-1/2 in., No. 4, No. 8, No. 16, No. 30, No. 50 and No. 100.

2.4 NORMAL WEIGHT COARSE AGGREGATE

A. Coarse aggregate shall consist of crushed stone or gravel. Sampling of coarse aggregate shall be in conformance with ASTM D-75. Sieve analysis shall be in accordance with ASTM C-136. Coarse aggregate shall conform to the following grading requirements:

B. Retained on 2" screen 0.0%
Retained on 1-1/2" screen ..... 0 to 5.0%
Retained on 3/4" screen ..... 25 to 60.0%
Retained on 1/4" screen ..... 95 to 100.0%
Deleterious substances shall not be present in excess of following percentages by weight:
Material removed by decantation..... 1.00%
Shale or slate 1.00%
Clay lumps 0.25%
Soft fragments..... 3.00%

C. Sum of all deleterious ingredients, exclusive of material removed by decantation, shall not exceed 4% by weight.

D. Coarse aggregate shall not exceed the following:

E. Soundness test (Sodium sulfate) weighted average loss at 5 cycles 15.0%
Absorption test 3.0%

F. Coarse aggregate shall not have a wear equivalent of more than 40 when tested for abrasion in conformance with ASTM C-131.

2.5 RETARDER – DENSIFIER

A. When a retarder-densifier is required it shall be Sika's "Plastiment", Sonneborn's "Sonotar" or an approved equal. Mixing shall be done in strict conformance with manufacturer's recommendations.

2.6 AIR-ENTRAINMENT AGENT

A. The use of air-entrainment admixture is required for all concrete. Air-entrainment shall be at least 3% but shall not exceed 5%. Mixing shall be done in strict conformance with manufacturer's recommendation. ASTM C-138, C-173 or C-231 shall govern.

2.7 WATER REDUCING ADMIXTURE

A. A high range water reducing admixture shall be used on all vertical concrete pours (such as walls) and a mid-range reducing admixture shall be used for all horizontal flatwork. A high range water reducing admixture shall meet the requirements for ASTM C494, Type G. Water reducing dosage rates shall be in accordance with manufacturer’s recommendations. Maximum slump prior to addition of the high range water reducer shall be 2”. Slump after addition of the high range water reducer will be 4” minimum to 8” maximum. Approved high range water reducing admixtures include Daracem 100 manufactured by W. R. Grace or Rheobuild 1000 manufactured by Masterbuilders. Mid-range water reducing admixtures shall also be manufactured by W. R. Grace, Masterbuilders or approved equivalent.

2.8 FLY ASH

A. Fly ash may be used if the following criteria are met:

a. Meets the requirements of ASTM C618, Class F.

b. Provide a Certificate of Compliance for the fly ash.

c. Mix design shall not contain more than 25% by mass of the cementitious material.

PART 3 – EXECUTION

3.1 PROPORTIONING OF CONCRETE

A. It is the intent of this specification to obtain concrete of a homogeneous structure that will be of such consistency and composition that it can be worked readily into corners and angles of forms and around the reinforcement without permitting materials to segregate or free water to collect on the surface. The concrete when it hardens will have a resistance to weathering and the required compressive strength. The general requirements for different compressive strength concrete are as follows:

Min. 28-day Compressive Strength	Max Allowable Water-Cement Content Gal. per sack of Cement*	Min. Cement Content-Sacks per Cubic Yard	Slump Range
1500 psi (Class E)	10.5	3.0	2"-6"
Seal Slab (Class D)		4.0	6"-8"
2000 psi (Class C)	7.5	4.0	2"-5"
2500 psi (Class B)	6.75	4.5	2"-5"
3000 psi (Class A)	6.25	5.25	2"-5"
4000 psi (Class 2-A)	5.0	6.5	2"-5"
5000 psi (Class 3-A)	4.0	7.0	2"-5"

* Maximum water/cement ratio for watertight structures shall be less than or equal to 0.35. For non-watertight structures, the maximum water/cement ratio shall be less than or equal to 0.45. Maximum allowable net water content will be the amount added to the mixer, plus free water in the aggregate based on the thirty minute absorption period. No allowanced will be made for evaporation of water after batching.

3.2 MIX DESIGN

A. General
It is the intent of these specifications that the Contractor is responsible for providing a mix design that will produce a concrete meeting the requirements of this specification.

B. Mix Design Report
The Contractor shall submit to the Engineer for approval six (6) copies of a mix design prepared by a reputable testing laboratory. The cost of the mix design shall be as set out in 02020 - Sitework Laboratory Testing Schedule. The mix design shall include mix proportions, water cement ratio, slump and workability characteristics required to produce the specified compressive strength concrete. The mix design shall be established by making, curing and testing a minimum of 5 standard size test cylinders for each strength concrete. Cylinders shall be made, cured and tested in conformance with ASTM C-192 and C-39. The mix design does not have to be prepared especially for this project, but it must apply to the materials being furnished. The mix design must be delivered to the Engineer four (4) days prior to the first pour. The Contractor shall have written notice from the Engineer approving the mix design before placing any concrete. If, during progress of the work, it is found impossible to secure concrete of required workability and strength with material being furnished by Contractor, the Engineer may order such changes as may be necessary to secure desired properties, subject to limiting requirements shown in Paragraph 3C1.3. Any changes so ordered shall be made at the Contractor's expense, and no extra compensation will be allowed by reason of such change.

3.3 CONSISTENCY

A. General
The quantity of water to be used shall be determined by the Engineer and shall be such as to give a mixture containing the minimum of water consistent with the required workability. The

quantity of water shall be varied only by the Engineer. The Contractor shall provide a concrete that has a consistency that conforms to the following:

a. The mortar will cling to the coarse aggregate.
b. The concrete is not sufficiently fluid to segregate to the place of deposit.
c. The concrete, when dropped directly from the discharge chute of the mixer, will flatten out at the center of the pile, but the edged of the pile will stand up and not flow.
d. The mortar will show no free water when removed from the mixer.
e. The concrete will settle into place when deposited in the forms; and when transported in metal chutes at an angle of 30 degrees with the horizontal, it will slide and not flow into place.
f. The surface of the finished concrete will be free from laitance or a surface film of free water

B. Concrete Failing To Meet Consistency Requirements

Any concrete mix failing to meet the above outlined consistency requirements, although meeting the slump requirements, will be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions. The slump test will be made by the Engineer in accordance with the methods outlined in ASTM C-143.

3.4 MIXING

A. General

The Contractor shall procure concrete from a "transit-mixed" concrete plant. Aggregates shall be proportioned by weight unless a satisfactory volumetric method of measurement is approved by the Engineer. The use of fractional sacks of cement will not be permitted unless the cement is proportioned by weight. Water shall be measured by an accurate measuring device which can be adjusted to compensate for variations in the free moisture content of the aggregate. The concrete shall be mixed in quantities required for immediate use, and any concrete which is not in place within one hour after start to mixing shall not be used unless otherwise authorized by the Engineer. In threatening weather, which in the opinion of the Engineer may result in conditions that will adversely affect the quality of the concrete to be placed, the Engineer may order postponement of the work. Where work has been started and changes in weather conditions require protective measures to be used, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall or damage due to freezing temperatures. In case it is necessary to continue mixing operations during rainfall, the Contractor shall provide protective covering for the material stockpiles as well as for the concrete being placed. The covering for aggregate stockpiles will be required only to the extent as may be necessary to control the moisture conditions in the aggregate so that adequate control of the consistency of the concrete mix may be maintained. No concrete shall be mixed without the approval of the Engineer when the air temperature is at or below 40°F. (taken in the shade away from artificial heat) and falling. If authorized for concrete placement during cold weather, the concrete will be placed in accordance with the PCA "Design and Control of Concrete Mixtures". The maximum temperature of cast-in-place concrete (Type I, Portland Cement and Type K, Shrinkage Compensating Cement) shall not exceed 98°F. If adjustments of the mixture for temperature control are required, then the procedure for hot-weather mixing, placing and curing shall be in accordance with ACI 305 Recommended Practice for Hot Weather Concreting.

B. "Transit-Mixed" Concrete

The mixing and the transporting operations shall conform with ASTM C-94. Mixing water shall not be added after a truck has left the plant except by permission of the Engineer or his representative. No concrete shall be used in the work which has been held longer than 1 hour in a mixer truck, unless approved by the Engineer. If dry batched to the job site, the batching plant operations shall conform with ASTM C-94. Transportation of the dry materials shall be performed in such a manner as to prevent loss, segregation or contamination of ingredients.

3.5 LABORATORY TESTING OF CONCRETE

A. Moisture content check will be made at sufficient intervals to maintain accurate batching and proportioning. All sampling will be done in accordance with ASTM sampling and testing procedures. See Section 02020 Sitework Laboratory Testing Schedule for test cylinder requirements. A set of test cylinders shall consist of 3 test cylinders. One cylinder shall be tested for strength at the age of 7 days, one cylinder at the age of 28 days, and one cylinder shall be held in reserve to be tested for strength when directed by the Engineer. The cylinders shall be made and cured in conformance with ASTM C-192. Curing facilities shall be provided in accordance with ASTM C-31. Cylinders shall be tested in conformance with ASTM C-39. Air content shall be tested in accordance with ASTM C173. Slump tested in accordance with ASTM C143.

3.6 FAILURES TO MEET STRENGTH REQUIREMENTS

A. Should the strength shown by the test specimens made and tested fall below the values required, the Engineer shall have the right to require changes in proportions, or to require additional curing on those portions of the structure represented by the test specimens which failed. If additional curing does not give the strength required, the Contractor will be responsible for removal and replacement of those portions which fail to develop required strength. Specimens will be considered to have failed when average strength for any period of placing is less than values indicated in the following table:

No. Days Consecutive Placing of Any One Class Of Concrete	Percent of Strength Specified
1	85
2	95
3	95
5 or more	100

When additional curing of portions of the structure is ordered by the Engineer, it shall be done at Contractor's expense and no claim for extra compensation for such additional curing shall be allowed. In no case shall the Contractor be required to provide such additional curing beyond a total of 21 days, except where average strengths of specimens, representing concrete placed on any three consecutive days, fall below 80% of the value specified in Part 3 “Proportioning of Concrete”. In this case, curing shall be contained until cores drilled from portions of the structure involved show an average strength equal to that specified in Part 3 “Proportioning of Concrete”. Cores shall have diameter of approximately three times the maximum size of aggregate and shall be tested in accordance with ASTM C-42.

3.7 STORAGE OF MATERIALS

A. Cement shall be stored off the ground in a well-ventilated, weatherproof building. Aggregate shall be stored in a manner that will prevent the mixing of foreign materials and in a manner to prevent segregation of the aggregate.

3.8 MEASUREMENT OF MATERIALS

A. The measurement of materials, except water, used in the batches of concrete shall be by weight. The different grades of aggregate shall be weighed separately. Cement may be measured by the bag. Water may be measured by volume. Allowance will be made for water content where moist aggregates are used.

END OF SECTION 03 30 03

SECTION 03 36 19 - PENETRATING REACTIVE CONCRETE STAIN

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Water-based reactive stained concrete floor finish.
2. Sealer.

B. Related Sections:

Edit to suit Project requirements.

1. Section 033000 “Cast-In-Place Concrete” for general concrete applications.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

B. International Concrete Repair Institute (ICRI):

1. ICRI Technical Guidelines: Series 300 - Concrete, Designation 310 - Surface Preparation.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical data, including Safety Data Sheet (SDS) and installation instructions, for each product specified.

B. Samples for Initial Selection: Manufacturer’s color charts showing full range of colors available.

C. Qualification Data: For manufacturer and Installer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years of documented experience producing the specified products.

B. Installer Qualifications: Minimum 5 years of documented experience with work of similar scope and complexity required by this Project and acceptable to, or certified by, concrete stain manufacturer.

C. Material Source Limitations: Obtain each specified material from the same source.

D. Concrete Stain Mockups:

1. Construct a 10 foot by 10 foot mockup at location selected by Architect.
2. Provide individual mockups for each color required.
3. Construct mockup using materials, processes, and techniques required for the work, including curing procedures. Incorporate representative control, construction, and expansion joints according to Project requirements. Installer for the work to construct mockup.
4. Mockup to be stained and sealed by the Installer who will actually perform the work for the Project. Record the amount of chemical stain needed per square foot of application to establish coverage rates for the work.
5. Notify Architect and Owner a minimum of seven calendar days in advance of the date scheduled for each mockup construction.
6. Obtain the Architect’s and Owner’s acceptance of each mockup prior to commencement of the work.
7. Each mockup to remain until completion of the work to serve as a quality control standard for the work. Provide suitable protections to preclude damage to mockup.
8. Approved mockup may become part of the completed work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable.

B. Store products in a location protected from damage, construction activity, and adverse environmental conditions, and away from combustible materials and sources of heat, according to manufacturer’s printed instructions and current recommendations.

C. Handle products according to manufacturer’s printed instructions.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature between 50 deg F and 90 deg F during application and at least 48 hours after application. Do not proceed with exterior applications during rainy, foggy, or very humid weather.

1.7 PREINSTALLATION CONFERENCE

A. Seven calendar days prior to scheduled date of installation, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, and manufacturer's authorized field representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Scofield, a Business Unit of Sika Corporation; Lithochrome Tintura. or comparable product by one of the following:

1. Butterfield Color, Inc.
2. H&C® Decorative Concrete Products; a brand of Sherwin-Williams Co.

2.2 MATERIALS

A. Water-Based Reactive Chemical Concrete Stain: Penetrating reactive water-based staining product that chemically bonds to cured concrete or cementitious topping substrates to produce permanent translucent color effects. Less than 100 g/L VOC content.

1. Product: "LITHOCHROME Tintura Stain, Sika Corporation."
2. Color(s): As selected by Architect from manufacturer's full range of standard colors.

B. Sealers:

1. SCOFIELD® Selectseal Plus™ , Sika Corporation

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which the concrete stain work will be performed and identify conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Concrete: Comply with the following:

1. Newly placed concrete to sufficiently cure for concrete to become reactive. Minimum cure time is 28 days.
2. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper complying with ASTM C 171. Do not overlap curing paper.

B. Surface Preparation for New or Existing Concrete:

1. Concrete surfaces should be completely penetrable before applying the initial application of chemical stain. The surface of the concrete should be lightly mechanically abraded to remove weak cement paste and contaminants. The final surface preparation should approximate a Concrete Surface Profile of 1, (CSP1 as designated by the International Concrete Repair Institute, Alexandria, Virginia). Methods for mechanical abrasion include:
    1. Pressure Washing: Use a pressure washer equipped with a fan tip and rated for a minimum pressure capability of 4000 psi.
    2. Scrubbing with a rotary floor machine with a Mal-Grit Brush from the Malish Corporation.
    3. Light sanding of the surface.
2. Rinse concrete substrates until rinse water is completely clean.

C. Completed preparation to result in concrete surfaces that are uniformly slip-resistant and profiled to meet a Concrete Surface Preparation (CSP) of 1-2 according to referenced ICRI guidelines.

3.3 CONCRETE STAIN APPLICATION

A. Protect surrounding areas, landscaping, and adjacent surfaces from overspray, runoff, and tracking. Divide surfaces into small work sections using walls, joint lines, or other stationary breaks as natural stopping points.

B. Apply concrete stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment according to the concrete stain manufacturer's printed instructions. Note the color of the liquid chemical stain will not be the final color produced on the concrete substrate.

1. Thoroughly power mix concrete stain base and tint materials immediately prior to use. For mixing stain materials, use an acceptable metal blade mixer.

C. Apply water-based reactive stain to substrates with an airless sprayer or High Volume Low Pressure (HVLP) sprayer, with a maintained and overlap controlled wet edge. A roller may also be used to apply material. If an airless sprayer or HVLC sprayer is used, the material may be manipulated mechanically to create a variegated appearance similar to that of an acid stain. If a roller is used an opaque monochromatic appearance will result.

1. Airless Sprayer: 1500 to 2500 psi variable outlet fluid pressure. 0.013 to 0.018 inch tip.

2. HVLP Sprayer: 5 to 40 psi spray pressure capability.

D. Reaction time will depend of wind conditions, temperature, and humidity level.

E. If required, apply a second coat after first coat has sufficiently dried and can be walked on without damage; normally two to four hours after application depending on temperature and humidity. Apply a third coat, if required, not less than two to four hours after the second coat application.

F. On vertical surfaces, start spray applications of reactive stain at the bottom and proceed upward. Apply stain material in light coats while maintaining a wet edge to ensue penetration into the surface.

3.4 SEALER APPLICATION

A. Concrete substrate must be completely dry.

B. After the final penetrating stain application has dried sufficiently, normally 8 to 24 hours at 75 degrees F and 50 percent relative humidity, remove all contaminants from surfaces by dry mopping if required.

C. Apply sealer according the sealer manufacturer's printed instructions at a rate of 300 to 500 square feet per gallon per coat, maintaining a wet edge at all times. Two coats are required. Maintain a wet edge at all times.

D. Allow sealer to completely dry before applying additional coats.

E. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

F. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

A. Provide temporary floor protection throughout the project to safeguard the surface quality of concrete slabs before and after application of decorative finishes or installations of other materials.

B. All concrete floors that will be not be covered by other materials will be protected throughout the project. The concrete slab must be treated as a finished floor at all times during construction.

C. Temporary Floor Protection will be removed only while finish work to the concrete is being performed and will be replaced after the final finish has cured sufficiently.

D. Temporary Floor Protection will be SCOFIELD Proguard Duracover, manufactured by Sika Corporation. Seaming of the temporary floor protection will be performed with SCOFIELD Proguard Heavy Duty Seaming Tape. Both products will be installed following the manufacturer's published installation procedures.

E. DO NOT APPLY THE HEAVY DUTY SEAMING TAPE TO BARE OR FINISHED FLOORS OR WALL SURFACES AT ANY TIME. IT WILL PERMANENTLY DAMAGE THE FLOOR

END OF SECTION 033619

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Pre-faced concrete masonry units (Glazed CMU).
3. Steel reinforcing bars.

1.2 DEFINITIONS

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

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

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include data on material properties material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. All work shall conform to the following:

1. “Building Code Requirements for Masonry Structures” (TMS 402) by The Masonry Society
2. “Specifications for Masonry Structures” (TMS 602) by The Masonry Society
3. “Technical Notes on Brick Construction” by the Brick Institute of America.

1.6 FIELD 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 TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

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

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Verify CMUs are manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If transporting materials by rail or water, multiply the distance transported by rail or water by 0.25 to determine the distance to Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight unless otherwise indicated.

D. Pre-faced CMUs (Glazed CMU): Lightweight hollow concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
   2. Size: Manufactured with pre-faced surfaces having 1/16-inch- wide returns of facing to create 1/4-inch-wide mortar joints.
   3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 CONCRETE LINTELS

A. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated.

2.4 MORTAR AND GROUT MATERIALS

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use masonry cement mortar.
   4. For reinforced masonry, use masonry cement mortar.
   5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

A. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For reinforced masonry, use Type S.

A. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of type indicated or, if not otherwise indicated, of type coarse (3/8” coarse aggregate, grading meeting ASTM C33 #8) that will comply with TMS 602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.

A. 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

2.5 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Heckmann Building Products, Inc.
      b. Hohmann & Barnard, Inc.
      c. Wire-Bond.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M. As indicated on drawings, if not indicated on drawings as indicated below.
   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: 0.187-inch diameter.
   4. Wire Size for Cross Rods: 0.187-inch diameter.
   5. Spacing of Cross Rods: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
   2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   3. Fabricate metal expansion-joint strips from to shapes indicated.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

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

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

2.8 MASONRY-CELL FILL

A. Lightweight-Aggregate Fill: ASTM C331/C331M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 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. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

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

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

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

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

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall 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 with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
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.

3.7 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

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

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

H. Prism Test: For each type of construction provided, according to ASTM C1314 at seven days and at 28 days.

3.9 REPAIRING, POINTING, AND 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. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.10 MASONRY WASTE DISPOSAL

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

END OF SECTION 042200

SECTION 05 04 00 − HOT-DIP GALVANIZING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Hot-dip galvanizing of iron and steel materials

1.2 RELATED WORK

A. Steel materials, fabrications and assemblies are specified to be furnished and installed in various other sections

1.3 REFERENCES

A. Publications
   1. American Galvanizers Association (AGA):
      a. Inspection of Products Hot-dip Galvanized After Fabrication
      b. The Design of Products to be Hot-dip Galvanized After Fabrication
      c. Recommended Details of Galvanized Structures
      d. Quality Assurance Manual
   2. Research Council on Structural Connections of the Engineering Foundation:
      a. Specification for Structural Joints Using ASTM A 325 or A 490 bolts.

B. Reference standards
   1. American Society for Testing and Materials (ASTM):
      a. A 123 / A 123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      b. A 143 Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
      c. A 153 / A 153M Zinc Coating (Hot-Dip) on Iron and Steel Hardware
      d. A 384 Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
      e. A 385 Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
      f. A 767 / A 767M Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
      g. A 780 Repair of Damaged Hot-Dip Galvanized Coatings
      h. B 6 Specification for Zinc
      i. D 6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
      j. E 376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods
   2. Federal specifications
      a. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair
      b. MIL-P-26915 Primer Coating, Zinc Dust Pigmented

1.4 QUALITY ASSURANCE

A. Coating applicator: Company specializing in hot-dip galvanizing after fabrication and following the procedures in the Quality Assurance Manual of the American Galvanizers Association.

B. Coordination Between Fabricator and Galvanizer: Prior to fabrication, fabricators shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator’s shop drawings for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.

C. Materials: For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25%, phosphorous below 0.04%, manganese below 1.3%, and silicon below 0.04%. Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special processing techniques are required.

1.5 DELIVERY, STORAGE & HANDLING

A. Load and store galvanized articles in accordance with accepted industry standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE COATING APPLICATORS

A. Members of the AGA or equal approved by the architect and/or engineer.

2.2 STEEL MATERIALS

A. Material for galvanizing to be geometrically suitable for galvanizing as described in ASTM A 384 and A 385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications and assemblies.

B. Recommended steel materials for hot-dip galvanizing include but are not limited to:
   1. Structural shapes and plates: ASTM A 36, A 242 type 2, A 283, A 441, A 500, A 501, A 529, A 572, A 588 and A 992.

2. Steel for fasteners:

General Category	Bolt Material	Nut Material
Carbon Steel	A 307 Gr A or B	A 563 Gr A
High-strength	A 325 Type 1	A 563 Gr DH
Tower Bolts	A 394	A 563 Gr A
Quenched & Tempered (*Carbon Steel Bolts*)	A 499	A 563 Gr C
Quenched & Tempered (Alloy Steel Bolts)	A 354 Gr BC	A 563 Gr DH

3. Steel for sheet metal articles: ASTM A 569 or A 570.
4. Steel for pipe or tubing: ASTM A 53, A 120 or A 595, Gr A or B.

2.3 FABRICATION REQUIREMENTS

A. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures.
B. Fabrication practices for products to be in accordance with the applicable portions of ASTM A 143, A 384, and A 385, except as specified herein. Avoid fabrication techniques that could cause steel distortion or embrittlement.
C. The fabricator shall consult with architect/engineer and hot-dip galvanizer regarding potential concerns, including handling issues, during the galvanizing process that may require design modification before fabrication proceeds.
D. Remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.
E. Provide holes and/or lifting lugs to allow for handling during galvanizing.
F. Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint and other deleterious material prior to fabrication.
G. Remove by blast-cleaning, or other methods, surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation.
H. Whenever possible, slip joints should be used to minimize field welding of material.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing.

3.2 COATING APPLICATION

A. Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A 123 / 123M.
B. Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A 153 / 153M.
C. Safeguard products against steel embrittlement in conformance with ASTM A 143.
D. Galvanize reinforcing steel in accordance with ASTM A 767.
E. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

3.3 COATING REQUIREMENTS

A. Conform to paragraph 6.1 of ASTM A 123 / 123M, Table 1 of ASTM A 153 / 153M, or Table 2 of A 767, as appropriate.
B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.
C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.4 TESTS

A. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication Inspection of Products Hot-dip Galvanized After Fabrication.
B. Include visual examination and tests in accordance with ASTM A 123 / 123M, A 153 / 153M, or A 767, as applicable, to determine the thickness of the zinc coating on the metal surface.
C. If requested by owner or architect/engineer, the steel fabricator shall be prepared to furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

3.5 REPAIR OF DAMAGED COATING

A. The maximum area to be repaired is defined in accordance with ASTM A 123 / 123M, Section 6.2, current edition.

1. The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.

B. Repair areas damaged by welding, flame cutting or during handling, transport or erection by one of the approved methods in accordance with ASTM A 780 whenever damage exceeds 3/16” in width. Minimum thickness requirements for the repair are those described in ASTM A 123 / 123M, Section 6.2, current edition.

END OF SECTION 05 04 00

SECTION 05120 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Structural steel.
   2. Architecturally exposed structural steel.
   3. Grout.

B. Related Sections include the following:
   1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Reference Architectural specifications for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 SUBMITTALS

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

B. Shop Drawings: Submit shop drawings of all structural steel members. Provide electronic (PDF) copies of each drawing. Shop drawings shall include fabrication piece drawings and field erection drawings. Structural construction drawings shall not be photocopied and submitted.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned bolted connections.
   5. For structural steel connections indicated to comply with design loads, include structural analysis data signed and sealed by a qualified professional engineer responsible for their preparations.

C. Welding certificates.

D. Qualification Data: For Installer and fabricator.

E. Mill Test Reports: Submit mill test reports upon request by project engineer. Mill test reports shall be signed by manufacturers certifying that the following products comply with requirements:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Direct-tension indicators.
   4. Tension-control, high-strength bolt-nut-washer assemblies.
   5. Shear stud connectors.
   6. Shop primers.
   7. Nonshrink grout.

F. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Erector Qualifications: A qualified erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. In lieu of AISC certification, erector may, at the general contractor’s recommendation and request, provide an in-house quality control program indicating compliance with minimum steel erection quality control requirements noted in AISC 360 – 10 “Specification for Structural Steel Buildings”, Chapter N, subsection N2.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, under Building QMS Certification Program, Category BU. In lieu of AISC certification, fabricator may, at the general contractor’s recommendation and request, provide an in-house quality control program indicating compliance with quality control procedures meeting minimum fabrication requirements noted in AISC 360 – 10 “Specification for Structural Steel Buildings”, Chapter N, subsection N2.

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

D. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."
   2. AISC 360 "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.”
   3. AISC's "Specification for the Design of Steel Hollow Structural Sections."

4. AISC's "Specification for Allowable Stress Design of Single-Angle Members.
5. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.
1. Coordinate finish painting requirements with Division 9 painting Sections.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M, ASTM A 572/A 572M, Grade 50 (345).

B. Channels, Angles Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M for general use, and ASTM A 572/A 572M, Grade 50 (345) for metal building built-up plate section members.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
1. Weight Class: As indicated on structural drawings.
2. Finish: Primed.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts;
1. Finish: Plain
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.
a. Finish: Plain.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head steel structural bolts with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
1. Finish: Plain.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
1. Configuration: Straight.
2. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 36 straight.
1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
4. Finish: Plain.

F. Threaded Rods: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6).
1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Washers: ASTM F 436 (ASTM F 436M) hardened and ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

G. Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
I. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
1. SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

2.4 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.
1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
5. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
6. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning"
F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
a. Grind butt welds flush.

b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials.
   5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

   1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
   1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
   2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design".

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
   4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
      a. Grind butt welds flush.
      b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
   1. In addition to visual inspection, field welds may be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 05 12 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. K-series steel joists.
2. KCS-type K-series steel joists.
3. K-series steel joist substitutes.
4. Joist accessories.

1.3 DEFINITIONS

A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

A. Design:

1. Joist shall be designed to meet SJI load table for specified joist sections and spans.
2. Joist shall be designed to meet additional uplift and concentrated loads as specified in contract structural drawings.

B. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

C. Design special joists to withstand design loads with live load deflections no greater than the following:

1. Floor Joists: Total Vertical deflection of 1/240 of the span.
2. Roof Joists: Total Vertical deflection of 1/240 of the span.
3. Special Joists: Reference drawings for specific deflection criteria.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of bearing plates to be embedded in other construction.
2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
3. Sealed joist calculations for each joist layout, type, and span, and loading condition.

C. Welding certificates.

D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.

F. Qualification Data: For manufacturer.

G. Field quality-control test and inspection reports.

H. Research/Evaluation Reports: For joists.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

B. Primer: Provide shop primer that complies with Division 9 painting Sections.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to “Standard Specifications for Open Web Steel Joists, K-Series” in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members for connecting and securing other construction to joists.

E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

G. Camber joists according to SJI's "Specifications".

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

D. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

E. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."

F. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3, as deemed necessary by the joist manufacturer’s paint and primer requirements.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner shall engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Field welds will be visually inspected according to AWS D1.1/D1.1M.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:

1. Radiographic Testing: ASTM E 94.
2. Magnetic Particle Inspection: ASTM E 709.
3. Ultrasonic Testing: ASTM E 164.
4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 31 00 – STEEL DECK

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data & Shop Drawings. Provide electronic (PDF) copies of all required submittal information.

B. Select deck categories from options in paragraph below.

C. Comply with SDI Publication No. 29, "Specifications and Commentary for Steel Roof Deck

D. Comply with AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Sheet: ASTM A 653 structural steel, and as follows:

1. Zinc-Coating Weight: G60 min.

2.2 DECKING

A. Roof Deck: Fabricate panels from galvanized steel sheet without top-flange stiffening grooves and as follows:

1. Deck Profile: Type 1.5B, wide rib
2. Profile Depth: 1-1/2 inches
3. Design Uncoated Steel Thickness: 22 GA (0.0295 inch)
4. Grade: Fy = 33 KSI

B. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.

2.3 MISCELLANEOUS

A. Accessories: Manufacturer's recommended roof deck accessory materials

B. Submit shop drawings indicating roof deck material, gage, and finish. Shop drawings shall provide deck sheet lengths and attachment weld patterns and side lap fastener requirements.

PART 3 - EXECUTION

3.1 DECK INSTALLATION

A. Install 1.5B, 22 GA roof deck panels and accessories according to SDI Publication No. 29. using 5/8” diameter puddle welds and #10 TEK screw side lap fasteners. Reference plans for fastening patterns. Fasten deck to perimeter angle using 5/8” diameter puddle welds at 6” o/c.

B. Place, adjust, align, and bear deck panels on structure. Do not stretch or contract side lap interlocks.

C. Place deck panels flat and square and weld to structure without warp or deflection.

D. Cut, reinforce, and fit deck panels and accessories around openings and projections as required in structural drawings.

E. Roof Deck Accessories: Install sump pans, sump plates, ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels. Weld to substrate.

F. Sound-Absorbing Insulation: Installation into flutes of deck, per deck manufacturer’s requirements.

G. Prepare and repair damaged galvanized coatings on both surfaces as required in structural drawings.

H. Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of painted deck panels.

I. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.

J. Do not use roof deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection at no cost to the Owner.

K. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.

L. Welding to conform to AWS D1.3 and done by competent experienced welding mechanics.

M. Areas scarred during erection and welds shall be thoroughly cleaned and touched-up with zinc rich galvanizing repair paint.

N. Provide metal concrete stops at edges of deck as required.

O. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.
2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.
4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Engineer. Provide any additional reinforcing or framing required for the opening at no cost to the Owner. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing.
   2. Soffit Framing.
   3. Ceiling joist framing.

B. Related Sections include the following:
   1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
   3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated in the drawings including mechanical fasteners, reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

B. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Miscellaneous structural clips and accessories.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

D. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
   1. Clark Dietrich Building Systems.
   2. Consolidated Fabricators Corp.; Building Products Division.

3. The Steel Network, Inc.

C. Basis-of-Design Product: The design for connector devices is based on Clark Dietrich, Inc. as indicated in other Part 2 Articles.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: ST33H for 18 gage studs and thinner and ST50H for 16 gage studs and thicker.
   2. Coating: G60 .

B. Steel Sheet for Vertical Deflection and Miscellaneous Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 50, Class 1 or 2.
   2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, punched, with stiffened flanges, of web depths, flange widths and gauges, as indicated on drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. Mechanical attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement; 68 mils minimum thickness, size as required by structural design calculations. Use only vertical deflection connection products that have a valid ICC ES Report complying with ICC Acceptance Criteria AC261, such as ICC-ESR-1903 or equivalent.
   1. Basis-of-Design Product: Clark Dietrich, Inc.
      a. Exterior Side of Wall: Clark Dietrich, Inc. Fast Clip Slide Clip (FCSC 3.1/2” and 5.1/2”)
      b. Exterior Head of Wall: Clark Dietrich, Inc. Fast Clip Top Clip (FTC3 and FTC 5).
      c. Non Deflection Clips: Clark Dietrich, Inc. Uni-Clip End Clip (UCEC).

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.
   9. Joist hangers and end closures.
   10. Hole reinforcing plates.
   11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Cold-Formed Steel Connections: ASTM 653/A653, zinc coated by hot-dip process according to ASTM A123/A 123M.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Shall be Hilti x-u (Dia=0.157”) with minimum concrete embedment of 1-1/4” and full penetration into steel. Reference drawings for spacing and edge distances.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 .

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by screw fastening standard with fabricator. Wire tying of framing members is not permitted.
    a. Locate mechanical fasteners and install according to manufacturer’s instructions, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by screw fastening according to manufacturer’s instructions.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. If required by Architect, install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations. Coordinate base of bottom track seal requirements with Architect.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.
    a. Locate mechanical fasteners and install according to manufacturer’s instructions, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Install built up stud jambs at window and door openings and other locations as indicated on structural drawings. Space studs as follows:

1. Stud Spacing: 16 inches or as indicated on structural drawings for special conditions.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Mechanically fasten vertical deflection clips to infill studs and anchor to building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, continuously inserted through punched web of stud and mechanically fastened to the web of each stud.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 13 - METAL BOLLARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface mounted metal bollards.
2. Direct burial metal bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Metal bollards.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples: For each type and finish of extruded .

PART 2 - PRODUCTS

2.1 SURFACE MOUNT METAL BOLLARDS

A. 48 inch exposed height.
B. 6 inch diameter steel pipe.
C. 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

2.2 DIRECT BURIAL METAL BOLLARDS

A. 48 inch exposed height.
B. 6 inch diameter steel pipe.

2.3 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 80) unless otherwise indicated.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5. Select fasteners for type, grade, and class required.
B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

2.6 METAL BOLLARDS

A. Fabricate all metal bollards from Schedule 80 steel pipe.
B. Fabricate surface mounted bollards with 3/8-inch- thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

2.7 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.8 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURFACE MOUNT METAL BOLLARDS

A. Anchor surfaced mounted bollards to concrete construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches in concrete.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.2 INSTALLATION OF DIRECT BURIAL METAL BOLLARDS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 13

SECTION 05 52 13 - PIPE AND TUBE RAILINGS (EXTERIOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

B. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STEEL RAILINGS

A. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

B. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 FASTENERS

A. Fastener Materials:

1. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.

B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast iron center of handrail 2-1/2 inches from wall.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: [and] [where indicated on Drawings], provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.

2. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

D. Form changes in direction as follows:

1. By bending.

E. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner [and as follows].

1. Comply with SSPC-SP 16.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
2. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
3. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
4. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
5. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 ATTACHING RAILINGS

A. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3.3 CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055213

SECTION 05 52 13.16 - ALUMINIUM RAILINGS (INTERIOR)

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. Aluminum railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

B. Samples for Initial Selection: For products involving selection of color, texture, or design.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..

b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 ALUMINUM RAILINGS

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded and Tubing: ASTM B221, Alloy 6063-T5/T52.

C. Extruded Structural and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B210/B210M, Alloy 6063-T832.

2.4 FASTENERS

A. Fastener Materials:
   1. Aluminum Railing Components: Type 316 stainless steel fasteners.
   2. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
   1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast aluminum, center of handrail 2-1/2 inches from face of railing .

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
   1. For aluminum and stainless steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

C. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
   1. Water-Resistant Product: At exterior locations , provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage , but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
   1. Clearly mark units for reassembly and coordinated installation.
   2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.
   1. Provide weep holes where water may accumulate.
   2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Form changes in direction as follows:
   1. By bending.
   2. By bending to smallest radius that will not result in distortion of railing member.

K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material .

C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post .

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and .

3.6 REPAIR

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in

3.7 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213.16

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion

when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:
   a. Southern pine or mixed southern pine; SPIB.

B. Framing Other Than Non-Load-Bearing Partitions: No. 2 grade.

1. Application: Framing other than interior partitions not indicated as load bearing.
2. Species:
   a. Southern pine; SPIB.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M .

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

2.8 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson Strong-Tie Co., Inc.; Strong-Drive or comparable product.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
   1. Use for wood-preservative-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

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

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
   3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect 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 061000

SECTION 06 16 00 - SHEATHING

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. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Gold.
   c. National Gypsum Company; Gold Bond e(2)XP.
   d. Temple-Inland Inc.; GreenGlass
   e. United States Gypsum Co.; Securock.
2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153MI.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.

2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.

3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 06 41 13 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

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. Architectural wood cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
3. Shop finishing of architectural wood cabinets.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including, panel products, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

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 electrical switches and outlets and other items installed in architectural wood cabinets.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.
2. PVC edge material.
3. Thermoset decorative panels.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer & fabricator.

B. Product Certificates: For each type of product.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: 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. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood veneers.

2.2 ARCHITECTURAL WOOD CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

2.3 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. Type of Construction: Frameless.

C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.

D. Wood for Exposed Surfaces:
   1. Species: White Oak.
   2. Cut: Plain sliced/plain sawn.
   3. Grain Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
   4. Matching of Veneer Leaves: Random match.

E. Semi-exposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
   2. Drawer Sub-fronts, Backs, and Sides: Thermoset decorative panels with PVC or polyester edge banding.
   3. Drawer Bottoms: Thermoset decorative panels.

F. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

G. Drawer Construction: Fabricate with exposed fronts fastened to sub-front with mounting screws from interior of body.
   1. Join sub-fronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

2.4 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
   2. Wood Moisture Content: 4 to 9 percent.

B. Composite Wood and Agri-fiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
   2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.5 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.6 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; [full-extension type; zinc-plated steel with polymer rollers.
2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
5. For computer keyboard shelves, provide Grade 1HD-100.
6. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.7 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.8 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets: 1/16 inch (1.5 mm) unless otherwise indicated.

C. Complete fabrication, including assembly**,** finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.9 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.

1. Back priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: System - 12, water-based polyurethane.
3. Staining: Match approved sample for color.
4. Filled Finish for Open-Grain Woods: Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinet level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. For shop finished items use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064113

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

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. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06100 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including, panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

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 electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
4. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.
3. Thermoset decorative panels.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product:

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Adhesives.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: 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. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08712 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. Regional Materials: Plastic-laminate cabinets shall be manufactured within 500 miles (800 km) of Project site.

D. Type of Construction: Frameless.

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. Reveal Dimension: 1/2 inch (13 mm).

G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Formica Corporation.
   b. Wilsonart International; Div. of Premark International, Inc. (Basis Of Design)

H. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

I. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
   a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join sub-fronts, backs, and sides with glued rabbet joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range (Standard and Premium lines) in the following categories or as indicated on drawings:
   a. Solid colors, matte finish.
   b. Solid colors with core same color as surface, matte finish.

c. Wood grains, matte finish.
d. Patterns, matte finish.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 70 percent.
2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Butt Hinges: 1-3/4-inch (70-mm), institutional five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
1. Semi concealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: BHMA A156.9, B04013; metal.

G. Drawer Slides: BHMA A156.9.
1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
6. For computer keyboard shelves, provide Grade 1.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, **Class 1 (clear)**, Quality-Q3, 6 mm thick unless otherwise indicated.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

N. Tackboards: Tackboards shall be ¼” Claridge cork on ¼” MDF backed with ¼: wide, anodized satin finished frame.
1. Color as selected by Architect from manufactures standard color selections.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Un-pigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION 06 41 16

SECTION 06 41 17 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

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 plastic-laminate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including, panel products, high-pressure decorative laminate and adhesive for bonding plastic laminate.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in plastic-laminate countertops.

C. Samples for Initial Selection:

1. Plastic laminates.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Adhesives.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: 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. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. Regional Materials: Plastic-laminate countertops shall be manufactured within 500 miles (800 km) of Project site.

D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Formica Corporation.
    b. Wilsonart International; Div. of Premark International, Inc.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by manufacturer's designations.
2. Match Architect's sample.
3. As selected by Architect from manufacturer's full range (Standard and Premium colors) in the following categories:
    a. Solid colors, matte finish.
    b. Solid colors with core same color as surface, matte finish.
    c. Wood grains, matte finish.
    d. Patterns, matte finish.
4. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: Same as laminate cladding on horizontal surfaces.

1. Post form countertop that are to receive sinks and that are in wet areas.

G. Core Material: Medium-density fiberboard.

H. Core Material at Sinks: medium-density fiberboard made with exterior glue.

I. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 70 percent.
2. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.

2.4 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesive for Bonding Plastic Laminate: Un-pigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
   3. Postform countertops that are to recieve sinks and that are in wet areas.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
   2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
   1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
   3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 41 17

SECTION 06 42 16 - FLUSH WOOD PANELING

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. Flush wood paneling (wood-veneer wall surfacing).
2. Wood furring, blocking, shims, and hanging strips for installing flush wood paneling unless concealed within other construction before paneling installation.
3. Shop finishing of flush wood paneling.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including, panel products, adhesives, and finishing materials and processes.

B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.

1. Show details full size.
2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
3. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
4. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. Apply WI Certified Compliance Program label to first page of Shop Drawings.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Fabricator.

B. Product Certificates: For each type of product.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: 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. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical paneling as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during the remainder of the construction period.

B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.

C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling.

2.2 PANELING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.3 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

A. Grade: Premium.

B. Wood Species and Cut: Maple.

C. Matching of Adjacent Veneer Leaves: Pleasing match.

D. Panel-Matching Method: Made-to-order, sequence-matched panels within each separate area.

E. Panel Core Construction: Hardwood veneer-core plywood.

1. Thickness: 3/4 inch (19 mm).

F. Exposed Panel Edges: Inset solid-wood or wood-veneer matching faces.

G. Assemble panels by gluing and concealed fastening.

2.4 MATERIALS

A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

B. Wood Moisture Content: 4 to 9 percent.

C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

C. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.

2. Multipurpose Construction Adhesives: 70 g/L.

3. Contact Adhesive: 80 g/L.

4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch (1.6 mm) or less in thickness to any surface): 250 g/L.

2.6 FABRICATION

A. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
   1. Lay out one elevation at a time if approved by Architect.
   2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
   3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.
   4. Rearrange paneling as directed by Architect until layout is approved.
   5. Do not trim end units and other non-modular-size units to less than modular size until after Architect's approval of layout.
   6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.

B. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.

C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
   1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.

C. Transparent Finish:
   1. Grade: Premium.
   2. Finish: System - 11, catalyzed polyurethane.
   3. Staining: Match approved sample for color.
   4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.

B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install paneling to comply with same grade as paneling to be installed.

B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.

C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless.

D. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.
   1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.

B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064216

SECTION 06 61 16 – SOLID SURFACING FABRICATIONS

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. Solid-surface material countertops and splashes at locations indicated in drawings.

2. Solid-surface material sills at all interior sills at exterior windows.

1.3 ACTION SUBMITTALS

A. Product Data: For sills, countertop and integral sink materials and benchtop materials.

B. Shop Drawings: Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Verify dimensions of window sills by field measurements after windows are installed.

1.5 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: 1/16-inch bullnose.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.

C. Backsplashes: 3/4-inch- (19-mm-) thick, solid surface material.

D. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

2.2 SOLID-SURFACE-MATERIAL SILLS

A. Configuration: Provide sills with the following front style:

1. Front: 1/2-inch thick with continuous bullnose along the front edge and exposed sides. Depth of sills will vary depending on the depth of each window sill. Typical sill overhang (from the wall below): ¾". Width of sills: full clear width of window opening with no seams permitted.

B. Fabrication: Fabricate in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.3 MATERIALS

A. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

1. Recycled Content: Not less than 70 percent preconsumer or postconsumer recycled content.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

C. Adhesives: Adhesives shall not contain urea formaldehyde.

D. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dupont Corian
b. Formica Corporation.
c. Wilsonart International (Basis of Design)

2. Type: Provide Standard Type or Veneer Type made from material complying with requirements for Standard Type, as indicated unless Special Purpose Type is indicated.
3. Colors and Patterns Schedule:

a. SS-1: Mystique 9200CS by Wilsonart.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

END OF SECTION 06 61 16

SECTION 07 21 13.13 – FOAM BOARD INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES IBC 2015.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Chemical Company (The); STYROFOAM Brand CAVITYMATE Plus Insulation.
2. Type X, 15 psi (104 kPa).

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

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

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

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

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive to provide

permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

3.4 PROTECTION

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

END OF SECTIO 072113.13

SECTION 07 21 16 - BLANKET INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber thermal blanket insulation at all exterior walls and exterior soffits with metal stud framing.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES 2015.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.2 INSULATION FASTENERS

A. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-(0.41-mm-)thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

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

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

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

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

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

B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 PROTECTION

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

END OF SECTION 072116

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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 fluid-applied, vapor-permeable membrane air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly , (150 sq. ft.) 14 sq. m, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.

b. Include junction with roofing membrane, building corner condition.

c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.

2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 283.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Synthetic Polymer Membrane:
      1) DuPont Protection Solutions: E. I. du Pont de Nemours and Company; Tyvek Fluid-Applied WB.
      2) Henry Company; Air-Bloc 31MR.
      3) Tremco Incorporated; ExoAir 230.
2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil-(1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil-(0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.

D. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil-(0.1-mm-) thick polyethylene film with release liner backing.

E. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

F. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.

I. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil-(0.1-mm-) thick polyethylene film with release liner backing.

K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil-(0.43-mm-)thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).

L. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil-(1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with aluminum termination

bars and stainless-steel fasteners.

M. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

N. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Re-prime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches (150 mm) o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch-(150-mm-) wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Re-prime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in one or more equal coats.

C. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches (75 mm) onto each surface according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 60 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings .
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. .

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. .

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips inside laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels : Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Manufacturing Company, Tee Panel or comparable product by one of the following:
   a. AEP Span; A BlueScope Steel Company.
   b. MBCI.

c. McElroy Metal, Inc.

2. Aluminum Sheet: Coil-coated sheet, ASTM B209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   a. Thickness: 0.032 inch.
   b. Surface: Smooth, flat finish.
   c. Exterior Finish: Three-coat fluoropolymer .
   d. Color: As selected by Architect from manufacturer's full range .
3. Clips: One-piece fixed to accommodate thermal movement.
   a. Material: 0.028-inch nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Panel Coverage: 12 inches.
5. Panel Height: 1.0 inch.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
   3. Basis-of-Design Product: Subject to compliance with requirements, provide GCP Applied Technologies Inc.; Grace Ice and Water Shield HT or comparable product by one of the following:
      a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
      b. Henry Company.

B. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.

E. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621 . Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below , wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the roof area indicated below:
   a. Roof perimeter for a distance up from eaves of 24 inches beyond interior wall line.
   b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
   c. Rake edges for a distance of 18 inches.
   d. Hips and ridges for a distance on each side of 12 inches.
   e. Roof-to-wall intersections for a distance from wall of 18 inches.
   f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.

B. Felt Underlayment: Apply at locations indicated below , in shingle fashion to shed water, and with lapped joints of not less than 2 inches.

1. Apply over the entire roof surface.
2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches, in shingle fashion to shed water.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Watertight Installation:
   a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
   b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
   c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

SECTION 07 46 46 - FIBER-CEMENT SIDING

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 fiber-cement siding and soffit.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
2. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.3 COORDINATION

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

1.4 PREINSTALLATION MEETINGS

1.5 ACTION SUBMITTALS

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

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

1.6 INFORMATIONAL SUBMITTALS

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

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

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

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

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

1.8 DELIVERY, STORAGE, AND HANDLING

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

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

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including cracking and deforming.
   b. Deterioration of materials beyond normal weathering.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Building Products, Inc.; HardiePlank® Lap Siding or comparable product.

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

C. Horizontal Pattern: Boards 7 inches wide in plain style.

1. Texture: Wood grain .

D. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Building Products, Inc.; HardieSoffit® Panels or comparable product.

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

C. Pattern: 16-inch-wide sheets with wood-grain texture.

D. Ventilation: Provide unperforated soffit unless otherwise indicated.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.4 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:

1. Corner posts.
2. Door and window casings.
3. Fasciae.
4. Moldings and trim.

C. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

D. Fasteners:

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

E. Insect Screening for Soffit Vents: .

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

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

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 24 inches o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

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

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

END OF SECTION 074646

SECTION 07 52 16.11 - SBS MODIFIED BITUMINOUS MEMBRANE ROOFING; HOT APPLIED

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing system on metal deck, including but not limited to:
    a. Roof insulation.
        1) Polyisocyanurate roofing insulation (as indicated on plans), 1/4" per foot slope or as required to provide positive drainage with NO PONDING. Provide for a minimum start thickness of 4.4" of polyisocyanurate at structural slope areas.
        2) Polyisocyanurate roofing insulation crickets & saddles (as indicated on plans), 1/2" per foot slope or as required to provide positive drainage with NO PONDING.
        3) One (1) layer of 1/2" thick high performance gypsum-fiber roof cover board.
    b. Roof membrane and membrane base flashings.
        1) One (1) ply of fire rated, high performance, fiberglass reinforced, SBS modified bitumen membrane with ultra-white surfacing, hot applied.
2. One (1) ply of polyester reinforced modified base sheet adhered with hot Install proper pads under all pipe supports.
3. Updraft Afterburner Kettles will be used for bitumen heating on all hot applied roofing projects.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" carpentry section for wood nailers, wood cants, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for shop- formed sheet metal items including roof drainage system items, roof penetration flashings, roof drainage systems, base and counterflashings and reglets and formed copings and roof edge metal items.

C. Alternates: Refer to Division 01 Section "Alternates" for description of Work in this Section affected by alternates.

D. Allowances: Refer to Division 01 Section "Allowances" for description of Work in this Section affected by allowances.

E. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.2 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg. F (14 deg. C), measured at the mop cart or mechanical spreader immediately before application.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative,, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review drawings and specifications.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.

9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
   1. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements, including UL listing certificate.
   2. Product Compatibility: Indicate manufacturer has verified compatibility of roofing system components, including but not limited to: Roofing membrane, flashing sheets, adhesives and sealants.

D. Warranties: Unexecuted sample copies of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of warranties.

1.7 SUBSTITUTIONS

A. General:
   1. ONLY Substitutions approved in writing by the Owner or Owner’s Representative prior to the scheduled bid date will be considered.
   2. Notification of approvals will be issued at least five (5) days before the scheduled bid date.
   3. Architect/Owner reserves the right to be final authority on acceptance or rejection of any substitution request.

B. When a particular make or trade name is specified, it shall be indicative of standard required. Bidders proposing substitutes shall submit the following ten (10) days prior to bid date to the Owner or Owner’s Representative; requests received after that time will not be considered.
   1. Written application with explanation of why it should be considered.
   2. Independent laboratory certification providing written confirmation that the physical and performance characteristics of the substitute material/system will meet the physical and performance characteristics of the specified materials and or system.

C. Submit five copies of request for substitution. Items to be included in the request:
   1. Complete data substantiating compliance of proposed substitution.
   2. Product identification, including manufacturer’s literature and manufacturer’s name.
   3. Current certificate from an accredited testing laboratory comparing the physical and performance attributes of the proposed material with those of the specified materials. Test results must be dated, notarized, and on testing laboratory stationary.
   4. Material Safety Data Sheets providing all pertinent data as to flammability, combustibility.
   5. List of at least (5) five jobs as described under the requirements where the proposed alternate material was used under similar conditions. These jobs must be available for inspection by the Owner or Owner’s Representative. Names and phone numbers are required for verification. Submit a minimum of 200,000 square feet for review. Submitted projects must be a minimum of (5) years old.
   6. Notarized statement from the Roof System Manufacturer, signed by a corporate officer of the corporation stating that:
      a. All Documents have been reviewed and are approved.
      b. The Project site has been inspected.
      c. The Roofing System Manufacturer will provide two (2) field inspections weekly; during, and until all construction work is complete and accepted by the owner. A full time employee of the manufacturer must perform inspections.

d. Provide documentation of the proposed alternate system passing the specified regulatory requirements. Documentation must be on the specified regulatory requirements letterhead or approval guide. No third party testing will be accepted.

D. In making substitution request, Bidder/Contractor represents:
1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified. Additionally, he will have a technical service representative of the proposed manufacturer attend the pre-bid meeting.
2. He will provide the same guarantee for substitution as for those specified.
3. He will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
4. Advise the owner of any credit savings or additional costs as opposed to the system type specified.

E. Substitutions will not be considered if:
1. Product or method to be considered does not have a minimum of (5) five years of successful performance in roofing and re-roofing of similar applications.
2. Any discrepancies in the test data, or if the tests or submittals are incomplete.
3. They are indicated or implied on Shop Drawings or Project Data Submittals without formal request submitted in accordance with the specification document.
4. Acceptance requires significant revision of documents.
5. Only substitutes approved in writing by prior to scheduled cutoff date will be considered.
6. Notification of approvals will be mailed at least 3 days before bid opening.
7. The Owner will not incur any additional costs for design or construction costs.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
1. Installer must provide (2) manufacturer inspections each week. Noncompliance may result in an $850 per day fee for missing inspections.
2. Roofing Contractors included in the following list are to the owner’s knowledge, the only pre-approved installers that can install and provide the system and warranty for this specified system. A list of additional certified contractors for the specified system can be obtained by contacting the system manufacturer.
a. American Contracting USA, Inc., Mr. Eddie Fuentes; (956) 748-4030.
b. Argio Roofing Inc., Mr. Rojerio Escobedo, (956) 748-9507.
c. Sechrist Hall Roofing, Mr. Bill McBride; (956) 423-3359
d. Rio Roofing Inc., Mr. Tom Gonzalez; (956) 423-3359
e. Haeber Roofing Company, Mr. Don Rucker; (361) 851-8142.
f. Port Enterprises, Inc., Mr Cody Comstock; (361) 289-2944.
g. Rain King, Inc; Mr. Jared Cain; (361) 576-0606
h. McNeil Roofing & Sheet Metal, Mr. Mike McNeil; (210) 651-4636
i. Rain Seal Master Roofing & Sheet Metal, Mr. Ramon Gonzalez; (361) 576-0926
j. American Roofing & Metal, Mr. Toby Cargile; (210) 224-5463
k. Tadco Roofing, Mr. Javier Ramos; (956) 227-4339

B. Manufacturer Qualifications: Approved manufacturer with UL listed roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

C. Roofing Inspector Qualifications: A technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be:
1. An authorized full-time technical employee of the manufacturer.

D. Random Sampling

1. During course of work, the Architect may secure samples according to ASTM D140-93 of materials being used from containers at job site and submit them to an independent laboratory for comparison to specified material.
2. Should test results prove that material is not equal to specified material:
    a. Contractor shall pay for all testing.
    b. Roofing installed and found not to comply with the specifications shall be removed and replaced with no change in the contract price.
3. Installation quality control
    a. The roofing inspector shall provide written and photographic reports, to be submitted to the architect, owner, roof system installation contractor, appraising the installation of the roof system at each of the project progress stages. The installation contractor shall make all necessary corrections, additions or remedial actions to resolve any issues raised in the reports.
    b. The roofing inspector shall have the authority to have any and all roofing work corrected, as required, to insure the proper installation and weather-tightness of the roof system, in accordance with the manufacturer's specifications.

E. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written instructions for installation of products.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
    1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

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

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 PROJECT / FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
    1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
    2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
    3. Remove temporary plugs from roof drains at end of each day.
    4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.11 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.
    1. Form of Warranty: Manufacturer's standard warranty form.
    2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.
    3. Warranty Period: 15 years from date of completion.

B. Manufacturer Inspection Service: To report maintenance responsibilities necessary for preservation of Owner's warranty rights and to perform periodic routine maintenance required, as described in Manufacturer's standard form. The cost of manufacturer's inspections is included in the Contract Sum.
    1. Scope of Service: Manufacturer's standard form.

2. Inspections to occur in following years: 2, 5, and 10 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.
1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.
2. Scope of Warranty: Work of this Section.
3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products.
1. Manufacturers of comparable products: Approved by Owner, Architect, or Owner's Consultant prior to bid.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures calculated in accordance with ASCE-7 and applicable code.
1. All Zones (Corner, Perimeter, and Field-of-Roof) Uplift Pressures: As indicated on Drawings. Verify specified system meets all uplift requirements with project windstorm engineer prior to installation if applicable.

C. Wind uplift Compliance: Provide roofing membrane, base flashing, and component materials that comply with the requirements to acquire a certificate of wind storm from the State of Texas. Basis of Compliance: NEMO Evaluation Report 11425.04.16-2-R15 For FL20325-R15 Construction S-222. IT IS THE CONTRACTORS RESPONSIBILITY TO READ AND FOLLOW THE PROVIDED TESTED ASSEMBLY. A LIST OF THE BASIS OF DESIGN ASSEMBLIES MAY BE LOCATED FROM THE NEMO WEBSITE OR THE SYSTEM MANUFACTURER.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1.
1. Design Pressure: As indicated on Drawings. Drawings. Verify installation methods are acceptable to project windstorm engineer prior to installation if applicable.

E. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.
5. Comply with requirements of Division 07 Section "Sheet Metal Flashing and Trim".

F. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

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

2.3 MATERIALS, GENERAL

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

2.4 ROOFING MEMBRANE MATERIALS

A. SBS Modified Bituminous Membrane Ply Sheets:

1. SBS-modified asphalt-coated composite urethane non-woven polyester fabric, ASTM D6164 Type I Grade S.
    a. Basis of design product: Tremco, POWERply Endure 200 Smooth.
    b. Tensile Strength at 0 deg. F (18 deg. C), minimum, ASTM D5147: Machine direction, 130 lbf/in (22.6 kN/m); Cross machine direction, 110 lbf/in (19.2 kN/m).
    c. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 55 percent; Cross machine direction, 60 percent.
    d. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 160 lbf (711N); Cross machine direction, 130 lbf (578N).
    e. Low Temperature Flexibility, minimum, ASTM D5147: -40 deg. F (-40 deg. C).
    f. Thickness, minimum, ASTM D5147: 94 mils (2.4 mm).

B. SBS Modified Bituminous Cap Sheet:

1. SBS-modified asphalt-coated glass-fiber-reinforced sheet, heat welded application, granular surfaced with a factory applied white reflective granule; CRRC listed and California Title 24 Energy Code compliant.
    a. Basis of design product: Tremco, POWERply Standard FR GT24W.
    b. Exterior Fire-Test Exposure, ASTM E108: Class A.
    c. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 70 lbf/in (12 kN/m); Cross machine direction 50 lbf/in (8 kN/m).
    d. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction,100 lbf (445 N); Cross machine direction 90 lbf (400 N).
    e. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 4 percent; Cross machine direction 4 percent.
    f. Low Temperature Flex, maximum, ASTM D5147: -10 deg. F (-23 deg. C).
    g. Thickness, minimum, ASTM D5147: 0.165 inch (4.2 mm).
    h. Solar Reflectance Index (SRI), ASTM E1980: 88.

C. Flashing Backer Sheet:

1. SBS-modified asphalt-coated composite urethane non-woven polyester fabric, ASTM D6164 Type I Grade S.
    a. Basis of design product: Tremco, POWERply Endure 200 Smooth.
    b. Tensile Strength at 0 deg. F (18 deg. C), minimum, ASTM D5147: Machine direction, 130 lbf/in (22.6 kN/m); Cross machine direction, 110 lbf/in (19.2 kN/m).
    c. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 55 percent; Cross machine direction, 60 percent.
    d. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 160 lbf (711N); Cross machine direction, 130 lbf (578N).
    e. Low Temperature Flexibility, minimum, ASTM D5147: -40 deg. F (-40 deg. C).
    f. Thickness, minimum, ASTM D5147: 94 mils (2.4 mm).

D. Membrane Flashing Sheet:

1. Flashing Sheet: Same as cap sheet.
    a. Basis of design product: Flashing Sheet: Same as cap sheet.
    b. Color: White.

2.5 ASPHALT MATERIALS

A. Asphalt Adhesive:

1. Hot-melt asphalt adhesive, ASTM D312 Type IV .
    a. Basis of design product: Tremco, Premium IV Adhesive.
    b. Softening Point, min/max, ASTM D36: 215–225 deg. F (100–105 deg. C).
    c. Ductility at 77 deg. F, (25 deg C) minimum, ASTM D113: 1.5 cm.

d. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D5: 15–25 dmm.
e. Available Manufacturers
1) Tremco
2) Valero

B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
1. Roof Cement, Asphalt-Based: ASTM D4586, Type II, Class I, fibrated roof cement formulated for use in installation and repair of asphalt ply and modified bitumen roofing plies and flashings; UL-classified for fire resistance.
a. Basis of design product: Tremco, ELS.
b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 190 g/L.
c. Non-Volatile Matter, ASTM D4586: 85 percent.
d. Resistance to sag ASTM D4586: 1/8 in. (3 mm).
2. Elastomeric Roofing Mastic, Pitch Pan Mastic, Vertical Striping Mastic, Low-Volatile: One-part, trowel-grade, elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings.
a. Basis of design product: Tremco, POLYroof LV.
b. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 300 g/L.
c. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D 412: 1000 percent.
d. Recovery from 500 percent Elongation, minimum, ASTM D 412: 500 percent.
e. Flexibility at -40 deg. F (-40 deg. C), ASTM D 3111: No cracking.
3. Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing..
a. Basis of design product: Tremco, BURmesh.
b. Tensile strength, 70 deg. F, ASTM D 146: Warp, 65 lbf/in (289 N); fill, 75 lbf/in
4. Three-course striping coating
a. Basis of design product: Tremco, Alumanation 301.
b. Cold-Applied Reflective Aluminum Roof Coating: ASTM D 2824 Type III metallic-pigmented, fibrated asphalt-based roof coating.

C. Asphalt Primer:
1. Asphalt primer, Low Odor: Low-odor, solvent-based asphalt primer.
a. Basis of design product: Tremco, TREMprime QD.
b. VOC, maximum, ASTM 3960

2.6 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Stripping Reinforcing Fabric:
1. Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing.
a. Basis of design product: Tremco, BURmesh.
b. Tensile strength, 70 deg. F, min ASTM D146: Warp, 65 lbf/in (285 N); fill, 75 lbf/in (310 N).
c. Color: Aqua green.

C. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
a. Basis of design product: Tremco, TremSEAL Pro.
b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.
c. Hardness, Shore A, ASTM C661: 40.
d. Adhesion to Concrete, ASTM C794: 35 pli.
e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).
f. Color: Closest match to substrate.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
   1. Available Manufacturers:
      a. Trufast - #14 HD Fastener with 3" plate
      b. Tremco - #14 HD Fastener with 3" plate

E. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."
   1. Vents and/or Stacks:
      a. Stainless: Type 316.
      b. Gage: Twenty-four (24).
      c. Solder: ASTM B32-89, alloy grade 60A. Neutralize flux after soldering.
   2. Termination Bar for top edge of all base flashings:
      a. Extruded aluminum, pre-punched 8” o.c.
   3. Primary Scuppers and Overflow Scuppers:
      a. Stainless Steel, Type 316 (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.
   4. Fascia, Coping, Collector Heads, Gutters, Downspouts and other Visible Sheet Metal Flashing: Match existing size, profile and location.
      a. Galvalume, Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50 (Class AZM150 coating designation, Grade 340), prepainted by the coil-coating process to comply with ASTM A 755/A 755M; structural quality.
         1) Paint finish at exposed side: Factory applied baked-on two (2) coat system comprised of one (1) coat of full 70% resin fluorocarbon by Kynar 500 or accepted substitute over a smooth coat of corrosion-resistant epoxy-based primer. Color as selected by owner.
         2) Finish at underside shall be a wash coat over a coat of corrosion-resistant epoxy-based primer
   5. Counter flashing, slip flashing:
      a. Galvalume, Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50 (Class AZM150 coating designation, Grade 340), prepainted by the coil-coating process to comply with ASTM A 755/A 755M; structural quality.
      b. Gage: Twenty-four (24)
   6. Pitch pans with hoods:
      a. Stainless Steel, Type 304: Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527, G90 coating in accordance with ASTM A 525
   7. Roof top splash pans.
      a. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface, .040-.050, with water slowing ridges.
      b. Stainless Steel, Type 316 (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527. Fabricate with water slowing ridges.
      c. Concrete splash pads at ground level: Refer to drawings for size and detail

F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
   1. Pipe Supports for large pipes and conduit:
      a. Pipe or Conduit size: 0.5” or larger ID
      b. Galvanized roller pipe supports.
      c. Basis of Design: SS8-R or RB-18 as applicable by PHP Pipe supports of Houston, TX or approved equal.
   2. Roof Drain & Scupper Target Striping: Polyurethane Elastomeric Fluid-Applied System: Two-coat fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

a. Basis of design product: Tremco, AlphaGuard BIO Top Coat.

3. Urethane based coating reinforcing fabric: Polyester Reinforcing and Protection Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings and as a protection layer under pavers or stone aggregates.
   a. Basis of design product: Tremco, Permafab.
4. Through wall flashing membrane: Impermeable, self-adhered sheet designed to be applied to exterior cavity walls to mitigate air infiltration/exfiltration, vapor transmission and water penetration.
   a. Basis of design product: Tremco ExoAir 110AT

G. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.7 ROOF INSULATION MATERIALS

A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
1. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

B. Roof Insulation:
1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.
   a. Basis of design product: Tremco, Trisotech Insulation.
   b. Compressive Strength, ASTM D1621: Grade 2: 20 psi (138 kPa).
   c. Conditioned Thermal Resistance at 75 deg. F (24 deg. C): 14.4 at 2.5 inches (50.8 mm) thick.
   d. Available Manufacturer's:
      1) Tremco
      2) Atlas AC Foam II

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per 12 inches (1:48) unless otherwise indicated.

2.8 INSULATION ACCESSORIES

A. Roof Insulation Cover Board:
1. Gypsum panel, cellulosic fiber reinforced, water-resistant, ASTM C1278/C1278M.
   a. Basis of design product: Tremco/USG Securock.
   b. Thickness: 1/2 inch (13 mm).

B. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

C. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

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

2.9 WALKWAYS

A. Walkway Material:
1. Walkway cap sheet strips, SBS-modified asphalt sheet, granular surfaced.
   a. Basis of design product: Same product as roof system cap sheet.
   b. Color: Color as selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Steel Roof Deck:
   a. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
   b. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
3. Verify that existing substrate is sound and dry.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer’s written instructions, approved shop drawings, and Contract Documents.

B. Install wood blocking, curbs, and nailers in accordance with requirements of Division 06 Section "Miscellaneous Rough Carpentry".

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

3.4 ROOFING INSTALLATION DETAILS

A. NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details and perimeter fastening requirements of FM Global references if applicable.

3.5 INSULATION INSTALLATION

A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.

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

C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.

D. Tapered Insulation, Drains, Saddles, and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

1. Where additional slopes at ridge are indicated or required to provide positive slope to perimeter edge, make slope not less than 1/4 inch in 12 inches.
2. Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope and not less than 1/2 inch in 12 inches.

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

F. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inch (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Install tapered insulation as shown on plan. It is the contractors responsibility to provide or enhance tapered crickets, saddles, or backslope towards drain locations to ensure positive drainage.
2. Flat Insulation System on Sloped Roof Deck: Install insulation at minimum thickness as follows:
   a. Minimum total thickness of Continuous Polyiso Insulation: 4.5.
3. Insulation Drain Sumps: Tapered insulation sumps, not less than 4 by 4 feet, sloped to roof drain, with a minimum insulation thickness of not less than one inch less than the Project-stipulated continuous insulation thickness based upon code requirements.

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

H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

I. Mechanically Fastened Insulation Application Method: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Fasten POLYISO roofing insulations to the deck through existing roofing per FM 1-29 Table 6 (Preliminary Insulation Securement).

J. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
   1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
   2. Secure coverboard through all insulations to the metal deck per wind uplift assembly. Provide for a minimum of 24 fasteners per 4x8 board of insulation or as directed by project windstorm engineer if applicable.

3.6 HOT APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
   1. Deck Type: Metal deck.
   2. Number of Smooth-Surfaced SBS-Modified Asphalt Sheets: One.
      a. Adhering Method: Mopped.
   3. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:
      a. Adhering Method: Mopped.

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

C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.

D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in compatible roofing cement/mastic, with joints and edges sealed.
      a. Comply with roofing membrane manufacturer’s instructions and details for waterstop/daily tie-in; utilize staggered layout and unadhered, removable “deadman” insulation boards.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
   3. Remove temporary plugs from roof drains at end of each day.
   4. Remove and discard temporary seals before beginning work on adjoining roofing.

3.7 BASE PLY SHEET INSTALLATION

A. Install modified bituminous roofing membrane base-ply sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
   2. Adhere base ply to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg. F (218 deg. C) ..

3.8 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane base-ply sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
   2. Adhere cap ply to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg. F (218 deg. C).

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps while bead is hot.

3.9 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:

1. Extend base flashing up walls or parapets a minimum of 12 inches (300 mm) above modified bituminous roofing and 6 inches (150 mm) onto field of roof membrane.
2. Prime substrates with primer if required by roofing system manufacturer.
3. Backer Sheet Installation: Mechanically fasten backer sheet to walls or parapets. Adhere backer sheet over roofing membrane at cants in a solid mopping of hot roofing asphalt.
4. Flashing Sheet Application: Hot mop to substrate.
    a. Seal top termination of base flashing with a metal termination bar.
5. Flashing Sheet Bottom Termination: Adhere flashing sheet to roof membrane sheet continuously along bottom of flashing sheet.

B. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of roofing cement, and extend onto roofing membrane. Apply number of course recommended by manufacturer.

C. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
1. Install stripping according to roofing system manufacturer's written instructions and specifications in Part 2.

D. Fluid-Applied Flashing and Detail Coating Application at Drain Locations: Complete Top coat and fabric reinforcement at scuppers and drains upon completion of roof system. Do not apply striping over cold applied oil based products. Apply Top coat and reinforcing fabric in accordance with manufacturer's written instructions.

3.10 WALKWAY INSTALLATION

A. Walkways, General: Install walkways according to roofing manufacturer's written instructions.
1. Install walkways at following locations:
    a. Where indicated on Drawings.
    b. Perimeter of each rooftop unit.

B. Walkway Cap Sheet Strips: Install cap sheet strips, approximately 36 inches (900 mm) wide and in lengths not exceeding 10 feet (3000 mm), leaving a space of 6 inches (150 mm) between strips. Install roofing membrane walkway cap sheet strips over roofing membrane in cold-applied adhesive.

3.11 FIELD QUALITY CONTROL

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
1. Notify Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075216.12

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

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. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets with counterflashing.
3. Formed roof-drainage sheet metal fabrications.
4. Formed low-slope roof sheet metal fabrications.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075216.11“SBS Modified Bituminous Membrane Roofing, Hot-Applied" for warranty requirements for sheet metal flashing and trim items integral with roofing.
3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
4. Section 079500 "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site in conjunction with pre-roofing conference.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Indicate details meet requirements of SMACNA, NRCA and FMG required by this Section.
3. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
4. Include identification of material, thickness, weight, and finish for each item and location in Project.
5. Include details for forming, including profiles, shapes, seams, and dimensions.
6. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
7. Include details of termination points and assemblies.
8. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
9. Include details of roof-penetration flashing.

10. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
11. Include details of special conditions.
12. Include details of connections to adjoining work.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Contractor's Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation, if required by architect or owner.

1. Build mockup of typical roof edge, eave, including built-in gutter, fascia, fascia trim and apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Flashings and Fastening: Comply with requirements of Division 07 roofing sections. Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. FMG 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
2. FMG 1-29 rev. May 2005: Loss Prevention Data Sheet for Above Deck Roof Components.
3. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; pre-painted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; non-perforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg. F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

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

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

3. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.

1. Stainless Steel: 0.016 inch thick. (26 gauge)

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Stainless steel, 0.019 inch thick. (24 gauge)

2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

3. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

6. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counter-flashing's lower edge.

7. Finish: Mill.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Galvanized Steel: 0.019 inch thick. (22 gauge)
2. Expansion Joints: Butt type with cover plate.
3. Accessories: Wire-ball downspout strainer.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Hanger Style: Connect downspout to rainwater collection cistern.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- wide, exposed cover plate.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- wide, exposed cover plate.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.024 inch thick. (24 gauge)

D. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.019 inch thick. (24 gauge)

E. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.024 inch thick. (22 gauge)

2.9 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick. (26 gauge)

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.024 inch thick. (22 gauge)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering.
2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

H. Rivets: Rivet joints in zinc where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.

2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.

3. Anchor gutter with gutter brackets spaced not more than 30 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.

4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

2. Connect downspout to rainwater collection cistern.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

D. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

E. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."

C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.7 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 07 72 00 – ROOF HATCHES

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. Roof hatch & ladder-assist post.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for metal vertical ladders for access to roof hatches.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Roof hatch assembly shall be tested to withstand twice the design roof uplift pressures noted on the contract drawings. The design roof uplift pressures pertaining to the roof hatch assembly will match the location of the roof where the roof hatch is installed.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.
5. Third party test reports meeting ASTM E330 protocol indicating proposed roof hatch assembly has been tested to comply with the uplift wind pressure requirements noted on the structural contract drawings.

1.6 CLOSEOUT SUBMITTALS

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

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leak proof, weather tight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

B. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

C. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

E. Steel Tube: ASTM A 500, round tube.

F. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

G. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

D. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
2. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counter flashing and weather tight perimeter gaskets, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bilco Company (The).
   b. Dur-Red Products.
   c. J. L. Industries, Inc.
   d. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
   e. O'Keeffe's Inc.

B. Type and Size: Single-leaf lid, 30 by 36 inches (750 by 900 mm).

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

D. Hatch Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.

1. Finish: Mill.

E. Construction:

1. Insulation: Polyisocyanurate board.
2. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.

F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

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

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm) above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- (41-mm-) diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.
   a. Color: Safety Yellow.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

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

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:

1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach ladder-assist post according to manufacturer's written instructions.

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

3.3 REPAIR AND CLEANING

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

B. Clean off excess sealants.

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

END OF SECTION 07 72 00

SECTION 07 84 46 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

1.3 ACTION SUBMITTALS

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

B. Product Schedule: For each penetration fire stopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration fire stopping condition, submit illustration, with modifications marked, approved by penetration fire stopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration fire stopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration fire stopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration fire stopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration fire stopping shall comply with the following requirements:

1. Penetration fire stopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration fire stopping is identical to those tested per testing standard referenced in "Penetration Fire stopping" Article. Provide rated systems complying with the following requirements:

a. Penetration fire stopping products bear classification marking of qualified testing and inspecting agency.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration fire stopping when ambient or substrate temperatures are outside limits permitted by penetration fire stopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration fire stopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration fire stopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration fire stopping.

PART 2 - PRODUCTS

2.1 PENETRATION FIRE STOPPING

A. Provide penetration fire stopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance

rating of construction penetrated. Penetration fire stopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Accessories: Provide components for each penetration fire stopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration fire stopping manufacturer and approved by qualified testing and inspecting agency for fire stopping indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
3. Steel sleeves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration fire stopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration fire stopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration fire stopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration fire stopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

3.4 IDENTIFICATION

A. Identify penetration fire stopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of fire stopping edge so labels will be visible to anyone seeking to remove penetrating items or fire stopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Fire stopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.

4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration fire stopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration fire stopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration fire stopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 46

SECTION 07 92 00 - JOINT SEALANTS

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. Silicone joint sealants.

2. Acoustical joint sealants.

B. Related Sections:

1. Section 04810 "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.

2. Section 08800 "Glazing" for glazing sealants.

3. Section 09250 "Gypsum Board" for sealing perimeter joints.

4. Section 09310 "Ceramic Tile" for sealing tile joints.

5. Section 09511 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealants.

1.3 ACTION SUBMITTALS

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

B. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.6 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.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

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 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 joint-sealant manufacturer, based on testing and field experience.

B. Stain-Test-Response Characteristics: Where 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. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

2.3 PICK PROOF & TAMPER RESISTANT JOINT SEALANT:

A. 2-component, 100% solids, moisture-tolerant, low-modulus, non-sag paste-consistency, epoxy resin binder.

1. Sikadur 23 Lo-Mod Gel, Sika Corporation

a. At all interior corridors

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. 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.

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, 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install 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.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

E. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Work under this section comprises of furnishing hollow metal doors and frames, including transom frames, sidelight and window frames with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled.
   1. Flush Steel Doors.
   2. Hurricane Doors.
   3. Steel frames.

B. Related Sections: Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section. The latest published edition of each reference applies.
   1. Section 06 10 00 - Rough Carpentry
   2. Section 08 14 00 - Wood Doors
   3. Section 08 71 00 - Door Hardware
   4. Section 08 80 00 - Glazing
   5. Section 09 90 00 - Painting and Coating
   6. Section 28 10 00 – Access Control

C. References: The intent of this document is that all hollow metal and its application will comply or exceed the standards identified below. The latest published edition of each reference applies.
   1. ANSI - American National Standards Institute - ansi.org
   2. NFPA - National Fire Protection Association
      a. NFPA 80 - Standard for Fire Doors and Other Opening Protectives
      b. NFPA 101 – Life Safety Code
      c. NFPA 105 – Standard Smoke Door Assemblies and Other Opening Protectives
      d. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
   3. DHI - Door and Hardware Institute – Door Security + Safety Professionals
      a. Installation Guide for Doors and Hardware.
      b. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
      c. Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
   4. SDI - Steel Door Institute
      a. SDI-105 – Recommended Erection Instructions for Steel Frames
      b. SDI-107 – Hardware on Steel Doors (Reinforcement - Application)
      c. SDI-111 - Recommended Details for Standard Steel Doors, Frames, Accessories, and Related Components
      d. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames
      e. SDI-118 – Basic Fire Door Requirements
      f. SDI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames
      g. SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors
      h. SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
      i. SDI A250.8 - SDI-100 Specifications for Standard Steel Doors and Frames
      j. SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
      k. SDI A250.11 - Recommended Erection Instructions for Steel Frames
      l. SDI A250.13 Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies
   5. BHMA - Builders Hardware Manufacturers Association
      a. BHMA A156.115 - Hardware Preparations in Standard Steel Doors and Frames.
      b. BHMA A156.7 - Hinge Template Dimensions.
   6. ASTM - American Society for Testing Materials
      a. ASTM A568/A568M-19a Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
      b. ASTM A879/A879M-12(2017) Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

c. ASTM A653/A653M-19a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
d. ASTM A924/A924M-19 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
e. ASTM A1008/A1008M-18 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

7. ICC - International Code Counsel
   a. ICC A117.1 – Accessible and Usable Building and Facilities.
   b. ICC 500 Standard for the Design and Construction of Storm Shelters
8. UL - Building Materials Directory; Underwriters Laboratories Inc.
   a. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies
9. NAAMM/HMMA – National Association of Architectural Metal Manufacturers/Hollow Metal Manufacturers Association
   a. NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.
10. WH - Certification Listings; Warnock Hersey International Inc.
11. Texas Department of Insurance TDI - Complies with TAS 201, TAS 202 and TAS 203, Large Missile Impact.

1.2 SUBSTITUTIONS:

A. All substitution requests must be submitted within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and their consultant

1.3 SUBMITTALS

A. Submittals to comply with provisions of Division 01, Submittal Procedures.
B. Product Data: Manufacturer's standard details and catalog data indicating compliance with referenced standards and manufacturer's installation instructions.
C. Shop Drawings: Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information to ensure doors and frames are properly prepared and coordinated to receive hardware.
   1. Elevations of each door and frame type.
   2. Details for door core.
   3. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   4. Locations of cutouts for glass and louvers.
   5. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   6. Mounting locations for hardware.
   7. Thickness of reinforcement/preparations for hardware.
   8. Details of anchorages, joints, field splices, and connections.
   9. Details of accessories.
   10. Details of moldings, removable stops, and glazing.
   11. Fire ratings.
   12. Finish.
D. Closeout Submittals to comply with Division 1, Closeout Submittals procedures.
E. Furnish copies of manufacturer’s warranty information and maintenance instructions.

1.4 QUALITY ASSURANCE

A. Hollow Metal Distributor is to be a direct account of the manufacturer of the products furnished. In addition, that distributor must have in their regular employment an Architectural Hardware Consultant (AHC), Certified Door Consultant (CDC), an Architectural Openings Consultant (AOC), a Door & Hardware Consultant (DHC) or equivalent door and hardware industry experience who will be available to consult with the Architect and Contractor regarding any matters affecting the door and frame opening.
B. Manufacturer Qualifications: Certified Member of the Steel Door Institute in good standing.
C. Installer: Minimum five years documented experience installing products specified this Section.
D. Certificates:
   1. Manufacturer's certification that products comply with referenced standards.
   2. Hollow Metal Manufacturer must provide documentation that they are an SDI Certified Manufacturer.
E. Fire Rated Doors and Frames: Underwriters' Laboratories, Intertek Testing Services/Warnock Hersey, and Factory Mutual labeled fire doors and frames:
   1. Provide labeled fire doors and frames in accordance with Underwriters Laboratories standard UL10C Positive Pressure Fire Tests of Door Assemblies.

2. Construct and install doors and frames to comply with current issue of NFPA 80.
3. Manufacture Underwriters' Laboratories labeled doors and frames in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
4. Manufacture Intertek Testing Services /Warnock Hersey labeled doors and frames in strict compliance to ITS/WH procedures and provide the degree of fire protection capability indicated by the opening class.
5. Manufacture Factory Mutual labeled doors and frames in strict compliance to FM procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
6. Affix a physical label or approved marking to each fire door and/or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency.
7. Conform to applicable codes for fire ratings. It is the intent of this specification that doors, frames, hardware and their application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.
8. For openings required to be fire rated exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

F. Hurricane Doors: Provide door systems complying with -
1. Texas Department of Insurance (TDI) protocols TAS 201, TAS 202 and TAS 203. Impact Resistance:
   a. The door assemblies are to satisfy TDI's criteria for protection from windborne debris in the Seaward zone.
   b. Assemblies must pass an impact criterion of equivalent to Missile Level D specified in ASTM E 1996.
   c. Assemblies to be installed at any height on the structure that does not exceed the assembly's design pressure rating.
   d. Assemblies do not require protection with an impact protective system when installed in areas that require windborne debris protection.
2. Provide test report data validating compliance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping
1. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided to prevent rust or damage.
2. Provide cardboard wrapped or crated product to provide protection during transit and job site storage
3. Should wrappers become wet, remove immediately

B. Delivery and Site Acceptance
1. The supplier shall deliver all materials to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Supplier shall coordinate delivery times and schedules with the contractor.
2. Deliver doors cardboard wrapped or crated to provide protection during transit and job site storage. Provide additional protection to prevent damage to any factory-finished doors. Mark all doors and frames with architects opening numbers as shown on the contract documents and shop drawings on the center hinge preparation location.
3. Upon delivery, check in doors and frames jointly with supplier. Inspect doors and frames upon delivery for damage, correct quantities or shortages. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the architect. Otherwise, remove and replace damaged goods as directed. Note shortages and replace immediately.

C. Storage and Protection
1. Handle, store and protect products in accordance with the manufacturers printed instructions, ANSI/SDI A250.8 – Specifications for Standard Steel Doors and Frames, A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames, or ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames and NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.
2. Store all materials in a dry area. All hollow metal material shall be stored so that it does not come in contact with water or moisture. Protect units from adverse weather elements.
3. Place units on 4 inch (102 mm) high wood sills to prevent rust and damage.
4. Store doors vertically under a properly vented cover, five units maximum in a stack with a ¼"

space between doors to permit air circulation.
5. Store frames in an upright position with heads uppermost under cover.
6. Store assembled frames five units maximum in a stack with 2-inch (51 mm) space between frames to permit air circulation.

1.6 COORDINATION

A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
B. Coordinate Work with frame opening construction, door and hardware installation.
C. Sequence installation to accommodate required door hardware.
D. Verify field dimensions for factory assembled frames prior to fabrication.

1.7 WARRANTY

A. Comply with Division 01 Closeout Submittals
B. All doors and frames shall be warranted in writing by the manufacturer against defects in materials and workmanship for a period of one (1) year commencing on the date of manufacture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design - MESKER a dormakaba Brand, Web: http://meskerdoor.com
   1. Acceptable Manufacturer - Curries an ASSA Abloy Company
   2. Acceptable Manufacturer - Steelcraft an Allegion Company
   3. Acceptable Manufacturer - Deansteel
B. Provide all steel doors and frames from a single SDI certified manufacturer.

2.2 General:

A. Physical performance: Units shall comply with the 1 million cycles swing test requirement per ANSI A250.4 - Level A.
B. Finishing:
   1. Raw, no primer
   2. Prime Gray to meet SDI A250.10
   3. Standard Color (on Galv doors and frames only) to meet SDI A250.3
   4. Custom Color
C. Electrical Requirements: Coordinate all electrical requirements for doors and frames. Make provisions for installation of electrical items so that wiring can be readily removed and replaced.
   1. Provide cutouts and reinforcements required for metal doors and frames to accept electric components.
   2. Frame with Electrical Hinges: Junction box welded over center hinge reinforcing. Top or bottom hinge locations are not permitted.
   3. Coordinate with Section 08 71 00 (or Division 28) for electrified hardware items.

2.3 DOORS

A. General: Construct exterior/interior doors to the following designs and gauges:
   1. Exterior Doors: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A653/A653M:
      a. Thickness:
         1) 14 gauge
      b. Provide flush top/closed top channel for exterior swing-out doors to eliminate moisture penetration. Galvannealed steel top caps are permitted.
   2. Interior Doors: Cold-rolled steel, ASTM A 1008/A 1008M:
      a. Thickness:
         1) 18 gauge
   3. Door Thickness: 1-3/4 inches
   4. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:
      a. Filled Vertical Edges (S): Continuous vertical mechanical interlocking joints with tack welds every 8 inches. Putty or filler applied to the edge seam and ground smooth.
   5. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are acceptable.
   6. Reinforce top and bottom of doors with galvannealed 16 gauge minimum, welded to both panels.
   7. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

8. Core Adhesion System – Basis of design - Moisture Cure Polyurethane Hot Melt:
    a. Adhesives are to cure completely, meaning once set, they cannot be re-melted and will not soften or freeze and lose adhesion.
    b. Adhesive system will have an enhanced resistance to flame spread in its cured state designed to pass UL 10C, Positive Pressure Fire Tests of Door Assemblies.
    c. Bonded assemblies will withstand prolonged exposure from -35°F(-37°C) to 200°F (93°C) temperatures without exhibiting any signs of bond failure.
    d. Cured adhesive film will remain flexible to allow for differences in thermal expansion and contraction of various substrates without sacrificing bond performance.
9. Core Material
    a. Treadcore Polystyrene
10. Glass moldings and stops:
    a. Fabricate from 18 gauge minimum steel:
    b. Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded corners.
    c. Trim: identical on both sides of the door.
    d. Labeled and non-labeled doors: use the same trim to match esthetics.
    e. Channeling requirements:
        1) Cutouts larger than 36” in height require 18 gauge perimeter channelings in the cutout of the door prior to installation of the lite kit our louver.
11. Hardware Reinforcements:
    a. Doors shall be mortised and adequately reinforced per the manufacturers guidelines for all hardware. Required mortise hardware reinforcements shall be drilled and tapped at the factory. Surface applied hardware shall be field drilled by hardware installer.
    b. Hinge reinforcements for full mortise hinges: minimum 7 gauge with an extra long, high frequency top hinge reinforcement as a standard feature.
    c. Lock reinforcements: minimum 16 gauge.
    d. Closer reinforcements: minimum 14 gauge steel.
    e. Projection welded hinge and lock reinforcements to the edge of the door.
    f. Provided adequate reinforcements for other hardware as required.

B. Full Flush Doors:
1. Basis of Design: Mesker N Series.

C. Hurricane Doors: Design to resist the cyclic pressures, static pressures and missile impact loads as detailed in the Miami-Dade County Product Control Approval System of the Florida Building Code Approval System and meets the requirements of Miami-Dade County test protocols PA 201, PA 202, PA 203 and Florida Building Code test protocols TAS 201, TAS 202 and TAS 203.

2.4 DOOR FRAMES

A. General: Construct exterior/interior metal door frames to the following designs and gauges;
1. Exterior Frames: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A 653/A653M:
    a. Thickness:
        1) 12 gauge.
2. Interior Frames in Masonry: Zinc-Iron Alloy-Coated galvannealed steel (A60) that conforms to ASTM A 653/A653M:
    a. Thickness:
        1) 16 gauge.
3. Interior Frames in stud wall construction: cold rolled steel, ASTM A 1008/A 1008M.
    a. Thickness:
        1) 16 gauge.

B. Flush Steel Frames:
1. Basis of Design: Mesker F-Series.
2. Profile:
    a. Face:
        1) 2 Inches face dimension and types and throat dimensions indicated on the Door Schedule.
        2) Custom special face dimension and types and throat dimensions indicated on the Door Schedule.

b. Stops:
1) Standard 5/8-inch-high stops

3. Provide reinforcements and accessories for specified hardware per SDI 250.6.
4. Anchors: Locate adjustable anchors in each jamb 6 inches from the top of the door opening to hold frame in rigid alignment.
a. Exposed fastener type; recessed hole at base of jamb for countersunk fastener installation.
b. Snap in base anchors
c. Strap anchors welded to frame
5. Fire Rating: Supply frame units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

2.5 ACCESSORIES

A. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.
B. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.
C. Plaster Guards: Same material as door frame, minimum 24 gauge (0.5 mm) minimum; provide for all strike boxes. Plaster guards not mandatory on interior after set frames.
D. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.
E. Glazing: Specified in Section 088000.

2.6 FABRICATION

A. Steel Frames:
1. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
a. Clearances shall comply with the requirements of NFPA 80.
2. Factory-welded frames: Head and jamb intersecting corners mitered at 45 degrees, with back welded joints ground smooth.
a. Continuous face weld the joint between the head and jamb faces along their length either internally or externally. Grind, prime paint, and finish smooth face joints with no visible face seams.
3. Provide temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.

B. Tolerances shall comply with SDI-117 "Manufacturing Tolerances for Standard Steel Doors and Frames."
C. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel sheet.
D. Unless otherwise indicated, provide exposed fasteners with countersunk flat or oval heads for exposed screws and bolts.
E. Prepare doors and frames to receive mortised and concealed hardware per final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI-107 and ANSI-A115 Series specifications for door and frame preparation for hardware.
F. Reinforce doors and frames to receive surface-applied hardware per SDI A250.6. Drilling and tapping for surface-applied hardware shall be done at Project site. Provide internal reinforcements for all doors to receive door closers and exit devices where scheduled.
G. Locate hardware as indicated on Shop Drawings or, if not indicated, per the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.7 FINISHES

A. Exposed door and frame surfaces to be cleaned and treated then coated with rust inhibitive primer. Water-based primer and color paint finishes to be free of Hazardous Air Pollutants (HAPS) and Volatile Organic Compounds (VOCs). Paint to comply with ANSI A250.3 and A250.10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are acceptable before beginning installation of frames.
1. Verify that completed openings to receive knock-down wrap-around frames are of correct size and thickness.
2. Verify that completed concrete or masonry openings to receive butt type frames are of correct

size.

B. Do not begin installation until conditions have been properly prepared.
C. Correct unacceptable conditions before proceeding with installation.

3.2 INSTALLATION

A. Install doors and frames in accordance with manufacturer's printed installation instructions and with Steel Door Institute's recommended erection instructions for steel frames SDI A250.11 and NAAMM/HMMA 840.
B. DHI – Door and Hardware Institute – Door Security + Safety Professionals – Installation Guide for Doors and Hardware
C. Fire Doors and Frames: Install in accordance with SDI A 250.11 and NFPA 80.
   1. To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National Code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed.
   2. Fit hollow-metal doors accurately in frames, within clearances specified in SDI A 250.11 and SDI 100. Install fire rated doors with clearances specified in NFPA 80.
D. Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Door Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors. Use additional anchors as required for height per manufacturers’ installation instructions.
   3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices. Use additional anchors as required for height per manufacturers’ installation instructions.
   4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws. Secure Sill Anchors to floor. Use additional anchors as required for height per manufacturers’ installation instructions.
   5. Drywall series frames are designed for installation in interior applications after construction of wood or metal stud and drywall applications. Drywall series frames are provided with adjustable jamb lock anchors for secure installation. Install frames per manufacturers’ installation instructions. Adjust anchors and secure sill and baseboard anchors as provided.
E. To comply with the Texas Department of Insurance TDI –
   1. Wall Framing Construction: The door assemblies may be mounted to several types of wall framing construction. The types of wall framing construction allowed include:
      a. Concrete (minimum compressive strength: 3,000 psi)
      b. Grout filled concrete block
      c. Hollow concrete block
      d. Steel (minimum 1/8", Fy = 36 ksi)
      e. Aluminum (minimum 1/8" thick, 6063-T6)
      f. Wood (Spruce-Pine-Fir, minimum S.G. = 0.42)
   2. Fastener Requirements:
      a. Refer to the approved drawings for the anchor layout and notes.
      b. Refer to the approved drawings for the minimum embedment depths for the fasteners and the minimum edge distances (minimum distance fastener must be from the edge of the substrate material) for the fasteners.
F. Remove temporary steel spreaders prior to installation of frames.
G. Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.
   1. Field splice only at approved locations indicated on the shop drawings.
   2. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
H. Grouting Hollow Metal Frames:
   1. Provide bituminous coating on interior of grout filled jambs.
   2. Provide and install temporary bottom and intermediate wood spreaders to maintain proper width and avoid bowing or deforming of frame members. Refer to ANSI A250.11-2001 and NAAMM/HMMA 840.

3. Comply with ANSI/SDI Standard A250.8, paragraph 4.2.2, and HMMA 820 TN01 Grouting Hollow Metal Frames, whereby grout will be mixed to provide a 4 inch (102 mm) maximum slump consistency and hand toweled into place. Do not use grout mixed to a thinner consistency.
4. Provide a vertical wood brace during grouting of frame at openings over 4 foot (1219 mm) wide, to prevent sagging of frame header.

I. Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.

J. Apply hardware in accordance with hardware manufacturers' instructions and Section 087100 of these Specifications. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide 1/8” at head and 1/8” at strike and hinge jamb with door undercut to meet fire ratings and floor conditions to achieve maximum operational effectiveness and appearance.

3.3 FIELD QUALITY CONTROL

A. Fire-Rated Door Assembly Testing:
1. Upon completion of the installation, test each fire door assembly to confirm proper operation of its closing device and verify that it meets all criteria of a fire door assembly per NFPA 80.
2. Perform inspections by individuals with documented knowledge and understanding of the operation components of the type of door being tested per NFPA 80 and NFPA 101.
3. Provide a written record to the Owner with copies available to the Authorities Having Jurisdiction (AHJ).
4. Record shall list the fire door assembly and include the door number with an itemized list of hardware set components for each door opening and location in the facility.

3.4 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.

C. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

D. Properly clean and apply paint to doors and frames in accordance with HMMA-840 TN01 and ANSI A250.8 appendix B along with Manufactures recommended surface preparation for painting.

3.5 PROTECTION

A. Protect installed products and finished surfaces from damage during construction.

END OF SECTION

SECTION 08 11 13.19 – SEVERE STORM HOLLOW METAL DOORS AND FRAMES

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. Severe storm hollow metal doors and frames at doors B130, B136A.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware for hollow metal doors and frames.
3. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ANSI/SDI A250.13 - Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.
7. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
12. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimens.
13. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
14. ASTM E 413 - Classification for Rating Sound Insulation.
15. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.
16. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtin Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
17. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
18. ANSI/NAMM/HMMA 867-06 - Guide Specifications for Commercial Laminated Core Hollow Metal Doors and Frames.
19. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
20. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
21. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
22. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
23. FEMA 361, Latest Edition – Design and Construction Guidance for Community Safe Rooms

24. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters.
25. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
26. TAS-201-94 - Impact Test Procedures.
27. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
28. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
29. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 10B - Fire Test of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:
1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.

D. Samples for Verification:
1. Samples are only required by request of the architect and for manufactures that are not current members of the Steel Door Institute.

E. Informational Submittals:

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Severe Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to FEMA 361, Latest Edition, Design and Construction Guidance for Community Safe Rooms; and ICC 500, Latest Edition, ICC/NSSA Standard for the Design and Construction of Storm Shelters.
1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

C. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. CECO Door Products.
2. Curries Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS FOR SEVERE STORM SHELTERS

A. General: Provide complete tornado or hurricane resistant door and frame shelter assemblies constructed to resist the design wind pressures for components and cladding and missile impact loads as described in ICC 500 – Latest Edition, ICC/NSSA Standard for the Design and Construction of Storm Shelters. Only single opening and paired opening doors and their frames constructed to resist calculated design wind pressures and laboratory tested missile impacts are acceptable.

1. Door systems, both single doors and paired openings, tested and complying with ICC 500 and FEMA 361 Latest Edition, Design and Construction Guidance for Community Safe Rooms and supported by third party test results.
2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.
3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CECO Door Products (C) - StormPro Series.
2. Curries Company (CU) - StormPro Series.

2.4 FRAMES FOR SEVERE STORM SHELTERS

A. General: Subject to the same compliance standards and requirements as standard hollow metal frames, provide complete tornado or hurricane resistant door and frame assemblies, for both single doors and paired openings, tested and labeled as complying with ICC 500 and FEMA 361 and supported by third party test results.

1. Fabricate exterior frames from 14 gauge hot dipped zinc coated steel that complying with ASTM designations A924 A60.
2. Manufacturers Basis of Design:
    a. CECO Door Products - StormPro Series.
    b. Curries Company - StormPro Series.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

2.6 ACCESSORIES

A. Mullions : Join to adjacent members by welding or rigid mechanical anchors.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
3. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
7. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Severe Storm Shelter Openings: Provide jamb, head, and sill anchors in accordance with manufacturer’s tested and approved assemblies.
8. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 11 13.19

SECTION 08 14 16 - FLUSH WOOD DOORS – WOOD VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Clearances and undercuts.
7. Requirements for veneer matching.
8. Apply Program label to Shop Drawings.

C. Samples: For plastic-laminate door faces .

1.3 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: Program certificates.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.4 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in .

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

2.3 SOLID-CORE, FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Masonite Architectural.
   b. Oshkosh Door Company.
   c. VT Industries Inc.
2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty .
3. Architectural Woodwork Standards Grade: Premium .
4. Faces: Single-plywood veneer not less than 1/50 inch thick.
   a. Species: White Oak.
   b. Cut: Plain sliced (flat sliced).
   c. Match between Veneer Leaves: Random match.
   d. Assembly of Veneer Leaves on Door Faces: Running match.
   e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
h. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."

5. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A .
   a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
   b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
   c. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.
      1) Finish steel edges and astragals with baked enamel.
      2) Finish steel edges and astragals to match door hardware (locksets or exit devices).
   d. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
      1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.
6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
   a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
      1) 5-inch top-rail blocking.
      2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
      3) 5-inch midrail blocking, in doors indicated to have armor plates.
      4) 5-inch midrail blocking, in doors indicated to have exit devices.
7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces .
   2. Profile: Flush rectangular beads .
   3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.
   1. Locate hardware to comply with DHI-WDHS-3.
   2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
   3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
   4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
   5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
   3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.
   1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   2. Finish faces, all four edges, edges of cutouts, and mortises.
   3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
B. Factory finish doors.
C. Transparent Finish:
   1. Architectural Woodwork Standards Grade: Premium .
   2. Finish: Architectural Woodwork Standards System-11, Polyurethane, Catalyzed.
   3. Staining: As selected by Architect from manufacturer's full range .
   4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
   5. Sheen: Satin .

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."
B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
C. Install frames level, plumb, true, and straight.
   1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
   2. Anchor frames to anchors or blocking built in or directly attached to substrates.
      a. Secure with countersunk, concealed fasteners and blind nailing.
      b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
         1) For factory-finished items, use filler matching finish of items being installed.
   3. Install fire-rated doors and frames in accordance with NFPA 80.
   4. Install smoke- and draft-control doors in accordance with NFPA 105.
D. Job-Fitted Doors:
   1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
      a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
   2. Machine doors for hardware.
   3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   4. Clearances:
      a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
      b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
      c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      d. Comply with NFPA 80 for fire-rated doors.
   5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08 41 13 – ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

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: Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

B. Related Sections:

1. 079200 “Joint Sealants”
2. 084113.13 “Interior Aluminum-Framed Entrances and Storefronts”
3. 088000 “Glazing”

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS

A. Storefront System Performance Requirements:

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures as indicated on drawings.
2. Structural Performance, Exterior Entrances and Storefronts: Capable of withstanding the following design wind loads:
   a. Design Wind Load: As indicated on Drawings .
   b. Testing: According to ASTM E330/E330M .
3. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. Air Leakage rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 6.2 psf (300 Pa) with interior seal, or, rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 1.6 psf (75 Pa) without interior seal.
4. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 15 psf (720 Pa) as defined in AAMA 501.
5. Uniform Load: A static air design load of 30 psf (1436 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
6. Windborne-Debris Impact Resistance: Provide impact-protective Exterior Entrances and Storefronts that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 1 for basic enhanced protection.
   a. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
   b. Small-Missile Impact: For aluminum-framed systems located above 30 feet (9.1 m) of grade.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed storefront system indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum-framed storefront system and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified, third party testing agency for each type of aluminum-framed storefront.

1. Test reports showing full compliance with ASTM E 330-14; ASTM E 1886-13a, and ASTM E 1996-14a.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.

5. Flashing and drainage.

G. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum-framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Section “Product Requirements”. Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination”.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 WARRANTY

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

a. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America, an Arconic company, IR 501T Framing – Impact Glazing or comparable product by one of the following:

1. Oldcastle Building Envelope™.
2. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Thermal Barrier:

1. IR 501T - Kawneer SINGLE IsoLock™ Thermal Break with one (1) 1/4" (6.4 mm) separations consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.

a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section “Glazing”.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 ENTRANCE DOOR SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America, an Arconic company, 500T Insulpour™ Thermal Entrance or comparable product by one of the following:

1. Oldcastle Building Envelope™.
2. YKK AP America Inc

B. Aluminum Door Frames: Fabricate tubular and channel frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards; reinforce as necessary to support required loads.

1. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods of j-bolts.
2. Design: Provide 2 ¼ inch thick doors of design indicated.
   a. Vertical Stile: 5 inch nominal width.
   b. Top Rail: 5 inch nominal width.
   c. Bottom Rail: 10 inch nominal width.
3. Major portions of the door members to be 0.125" (3.2 mm) nominal in thickness and glazing molding to be 0.05" (1.3 mm) thick
4. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.
5. Entrance Door Hardware: As specified in Division 084113 Section “Door Hardware”.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section “Joint Sealants”.

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.7 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints; make joints flush, hairline and weatherproof.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Storefront Framing: Fabricate components for assembly using manufacturer’s standard installation instructions.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

PRODUCT DATA SHEET 1 - Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2.1 Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
   a. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight sliding door installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
   3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.
B. Install aluminum-framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.
E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
   1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
      a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.
      b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).
B. Manufacturer's Field Services: Upon Owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113

SECTION 08 41 13.16 – INTERIOR ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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: Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

B. Related Sections:

1. 084113 “Aluminum-Framed Entrances and Storefronts”
2. 088000 “Glazing”

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed storefront system indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum-framed storefront system and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, of aluminum-framed storefront.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum-framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Section “Product Requirements”. Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination”.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.7 WARRANTY

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America, an Arconic company, TriFab 400 Framing System (Non-Thermal) or comparable product by one of the following:
   1. Oldcastle Building Envelope™.
   2. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum framing members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

D. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section “Glazing”.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 ENTRANCE DOOR SYSTEMS

A. Aluminum Door Frames: Fabricate tubular and channel frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards; reinforce as necessary to support required loads.
   1. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods of j-bolts.
   2. Design: Provide 1-3/4" thick doors of design indicated.
      a. Narrow stile (3 1/2" nominal width).
   3. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section “Joint Sealants”.

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.7 FABRICATION

A. Extrude aluminum shapes before finishing.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints; make joints flush, hairline and weatherproof.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

D. Storefront Framing: Fabricate components for assembly using manufacturer’s standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
   a. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight aluminum- framed storefront installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.

B. Install aluminum-framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113

SECTION 085619 - INTERIOR SLIDING PASS-THRU WINDOWS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes:
   1. Interior pass-thru sliding service windows as indicated in drawings and in sections.

1.2 RELATED REQUIREMENTS

C. Glass and Glazing: Section 088000, GLAZING.

1.3 SUBMITTALS

A. Shop Drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

B. Product Data: Submit Manufacturer's technical product data substantiating that products comply, and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage.

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

D. Protect products from damage during handling and construction operations.

1.5 WARRANTY

A. Warranty: All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Header: Shall be constructed of 6063-T5 extruded aluminum. Window rolls on top-hung ball bearing rollers. Overall size is to be in accordance with the contract drawings.

B. Finish: All aluminum to be brite anodized, satin anodized, or bronze anodized (Specify).

C. Glazing: The glazing is to be ¼" (6 mm) in thickness.

D. Options: Keyed lock, push button lock, fixed sidelite header insert, recessed bottom track.

2.2 PRODUCTS GENERAL

A. Basis-of-Design Product: Subject to compliance with requirements, provide C.R. Laurence Co., Inc.; CRH Americas, Inc.; Sharyn Frameless Pass-Thru Window or comparable product.

2.3 PASS WINDOWS

A. Pass Window Units: Factory fabricated, glazed unit; horizontal sliding type.
   1. Header: Extruded aluminum.
   2. Glass: Safety type specified in Section 08 80 00, GLAZING.
   3. Hardware: Manufacturer's standard double track header, rollers, guides, push button lock.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Verify rough opening is properly sized and located.

C. Protect existing construction and completed work from damage.

D. Apply barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION

A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.3 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.4 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 08 56 20 - INTERIOR SLIDING SERVICE WINDOW

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:
   1. Aluminum, medium-duty interior sliding service windows.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage.
B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

A. Provide sliding, transaction windows.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide C.R. Laurence Co., Inc.; CRH Americas, Inc.; Barbara (OXO) or comparable product by one of the following:

2.02 MATERIALS

A. Frames: Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Window rolls on top-hung ball bearing rollers. Catch locks included with all interior windows. Overall frame sizes are to be in accordance with the contract drawings.
B. Finish: All aluminum to be clear anodized.
C. Glazing: The glazing vinyl supplied is for ¼" in thickness. Glass not included, to be supplied by others.
D. Options:
   1. Keyed lock
   2. Overhead track
E. Models: Barbara (OXO), X = sliding panel, O = fixed panel, as viewed from clerks side.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 08 56 59 - ALUMINUM CASHIER WINDOW

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:

1. Aluminum cashier windows as indicated in drawings and in sections.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.

B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

A. Basis-of-Design Product: Subject to compliance with requirements, provide C.R. Laurence Co., Inc.; CRH Americas, Inc.; Aluminum Cashier Window, Model SCW103N or comparable product.

2.02 MATERIALS

A. Frames: Aluminum cashier window frame to be 1.390" x .625" extruded aluminum. Overall frame size to be 30" W x 32"H (Includes 2" H stainless steel shelf.)

B. Finish: All aluminum to be clear anodized.

Glazing: ¼" Clear tempered Glass.

C. Shelf: Provide a shelf not less than 2" thick with recessed deal tray. The shelf is to be the full width of the window and 18" deep centered under the glazing.

D. Voice Transmission: Communication permitted by 834A no draft speak-thru centered in glazing.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install frames and glazing in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and hollow metal doors.
B. Hardware for fire-rated doors.
C. Lock cylinders for doors with balance of hardware specified in other sections.
D. Thresholds.
E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.
B. Section 081213 - Hollow Metal Frames.
C. Section 081416 - Flush Wood Doors.
D. Section 081433 - Stile and Rail Wood Doors.
E. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
F. Division 26 Electrical

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
B. BHMA A156.1 - Standard for Butts and Hinges 2021.
C. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.
D. BHMA A156.3 - Exit Devices 2020.
E. BHMA A156.4 - Door Controls - Closers 2019.
F. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
G. BHMA A156.6 - Standard for Architectural Door Trim 2021.
H. BHMA A156.7 - Template Hinge Dimensions 2016.
I. BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
J. BHMA A156.16 - Auxiliary Hardware 2018.
K. BHMA A156.21 - Thresholds 2019.
L. BHMA A156.22 - Standard for Gasketing 2021.
M. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.
N. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.
O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
P. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
Q. DHI (KSN) - Keying Systems and Nomenclature 2019.
R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
S. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.
T. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
U. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
V. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

W. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

X. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

Y. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

Z. Storm Codes:
   1. Texas Department of Insurance (TDI).

AA. UL (DIR) - Online Certifications Directory Current Edition.

BB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

CC. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. List groups and suffixes in proper sequence.
   4. Include complete description for each door listed.
   5. Include manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   6. Include account of abbreviations and symbols used in schedule.

D. Samples for Verification:
   1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   2. Include product description with samples.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Supplier's qualification statement.

I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

J. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

L. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

M. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Twenty five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets: Ten years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

D. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

E. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

F. See Section 281000 for additional access control system requirements.

G. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
   4. Provide wall grip inserts for hollow wall construction.
   5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
      a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
      b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
   5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
   7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
   1. BEST; dormakaba Group: www.bestaccess.com/#sle.
   2. Ives, Allegion Group.
   3. Mckinney, Assa Abloy Group.

B. Properties:
   1. Butt Hinges: As applicable to each item specified.
      a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
      b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
      c. Template screw hole locations.
      d. Bearing assembly installed after plating.
      e. Bearings: Exposed fully hardened bearings.
      f. Bearing Shells: Shapes consistent with barrels.
      g. Pins: Easily seated, non-rising pins.

1) Fully plate hinge pins.
2) Non-Removable Pins: Slotted stainless steel screws.

h. UL 10C listed for fire-resistance-rated doors.

C. Sizes: See Door Hardware Schedule.
1. Hinge Widths: As required to clear surrounding trim.
2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
1. Fully polish hinges; front, back, and barrel.

E. Grades:
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
1. Butt Hinges: Include full mortise hinges.

H. Options: As applicable to each item specified.

I. Quantities:
1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
a. Hinge weight and size unless otherwise indicated in hardware sets:
1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
2) For doors over 36 inches (914 mm) wide up to 48 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
3) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.

J. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

K. Products:
1. Butt Hinges:
a. Ball Bearing, Five (5) Knuckle.

2.04 EXIT DEVICES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Von Duprin, Allegion Group.

B. Properties:
1. Actuation: Full-length touchpad.
2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
4. Lever Design: Match project standard lockset trims.
5. Cylinder: Include where cylinder dogging or locking trim is indicated.
6. Strike as recommended by manufacturer for application indicated.
7. Sound dampening on touch bar.
8. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.

9. All exposed exit device components to be of architectural metals and “true” architectural finishes.
10. Handing: Field-reversible.
11. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
12. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

D. Options:
1. Internally mounted switch used to signal other components.
2. MLR: Motorized latch retraction.
3. Furnish less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.

E. Products:
1. 2000.

2.05 LOCK CYLINDERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Schlage, Allegion Group.

B. Properties:
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
a. Provide cylinders from same manufacturer as locking device.
b. Provide cams and/or tailpieces as required for locking devices.
c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:
1. Manufacturer's standard corrosion-resistant brass alloy.

E. Types: As applicable to each item specified.
1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1C - 7-pin cores.

F. Applications: At locations indicated in hardware sets, and as follows
1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:
1. Rim/mortise.

2.06 CYLINDRICAL LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Schlage, Allegion Group.

B. Properties:
1. Mechanical Locks:
a. Fitting modified ANSI A115.2 door preparation.

b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
    1) Through-bolted anti-rotational studs.
d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
e. Bored Hole: 2-1/8 inch (54 mm) diameter.
f. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
g. Latch: Single piece tail-piece construction.
    1) Latchbolt Throw: 9/16 inch (14.3 mm), minimum.
h. Cylinders:
    1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
        (a) Small format interchangeable.
i. Lever Trim:
    1) Style: See Door Hardware Schedule.
    2) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
    3) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
    4) Independent spring mechanism for each lever.
        (a) Contain lever springs in the main lock hub.
    5) Outside Lever Sleeve: Seamless one-piece construction.
    6) Keyed Levers: Removable only after core is removed by authorized control key.

C. Finishes: See Door Hardware Schedule.
    1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.
    1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's stadard for specified lock.
    1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
    2. Outside Lever Sleeve: Hardened steel alloy.

F. Options:

G. Products: Cylindrical locks, including mechanical and electrical types.
    1. 9K (Grade 1).

2.07 AUXILIARY LOCKS (DEADLOCKS)

A. Manufacturers:
    1. BEST, dormakaba Group: www.bestaccess.com/#sle.
    2. Sargent, Assa Abloy Group.
    3. Schlage, Allegion Group.

B. Properties:
    1. Backset: 2-3/4 inch (70 mm), unless otherwise indicated.
    2. Strike: Appropriate for door frame.
    3. Cylindrical Deadbolt: Manufacturer's standard, adjustable to accommodate range of door thicknesses indicated.
        a. Door Thickness Fit: 1-3/8 inches (35 mm) to 3 inches (76 mm) thick doors.
        b. Bolt Throw: 1 inch (25.4 mm) hardened steel.
        c. UL listed for up to 3 hours.

C. Grades:

1. Cylindrical Deadbolts: Tested and approved by BHMA A156.36, Operational Grade 1.

D. Products:
1. 82/83T (Cylindrical, Grade 1).

2.08 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

2.09 CLOSERS

A. Manufacturers:
1. BEST, dormakaba Group www.bestaccess.com/#sle.
2. LCN, Allegion Group.
3. Sargent, Assa Abloy Group.

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
a. Construction: R14 high silicon aluminum alloy.
b. Maximum Projection from Face of Door: 2-7/16 inches (62 mm).
c. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
1) Include advanced backcheck feature.
2) Include delayed action feature.
d. Hydraulic Fluid: All-weather type.
e. Arm Assembly: Standard for product specified.
1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
2) Where “IS” or “S-IS” arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
f. Covers:
1) Type: Standard for product selected.
(a) Full.
2) Material: Plastic.
3) Finish: Painted.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

E. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.

3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

F. Products:
1. Surface Mounted:
a. HD8000.

2.10 PROTECTION PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
b. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

2.11 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
1. Wall Bumpers: Bumper, concave, wall stop.

F. Installation:
1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
1. Wall Bumpers.

2.12 THRESHOLDS

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.

E. Products:

2.13 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft. of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft.of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   2. Adhesive-Backed Perimeter Gasketing: Slilicone gasket material applied to frame with self- adhesive.
   3. Rigid, Housed, Perimeter Gasketing: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with screws.
   4. Door Sweeps: Neoprene gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.

C. Grades: Comply with BHMA A156.22.

2.14 MISCELLANEOUS ITEMS

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Coat Hooks: Provide on room side of door, screw fastened.
      a. Material: Brass.
   2. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
      a. Single Door: Provide three on strike jamb of frame.
      b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
      c. Material: Rubber, gray color.

C. Products:
   1. Coat Hooks.
   2. Silencers.

2.15 ELECTRIFIED HARDWARE

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. RCI; dormakaba Group: www.dormakaba.com/us-en/#sle.
   3. Sargent, Assa Abloy Group
   4. Schlage, Allegion Group
   5. Von Duprin, Allegion Group

B. Properties:
   1. Door Position Switches: Recessed devices with magnetic contacts.
      a. Switch Type: Using two Form C high reliability Rhodium-plated reed switches.
      b. SPDT configuration.
   2. Power Supply Units: Manufacturer's standard.
      a. Enclosures: Lockable NEMA Type 1, with hinged cover and knockouts.
      b. Emergency Release Terminals: Designed to release devices upon activation of fire alarm system.
      c. Auxiliary contacts for remote signaling.

d. User-selectable time delay from 0 to 4 minutes.
e. Fire Alarm System Interface: Standard.
1) Fire alarm terminal with green LED indicating power is available.
f. Output Distribution Board with indicator LEDs.
g. On/Off LED power indicator.
3. Power Transfers: Manufacturer's standard.
a. Mortised Type with Wires & Connectors:
1) Listed by UL and ULC.
2) Stainless steel housing and spring conduit.
3) Wire Harness: Pre-installed, twelve wire, equipped with ten (10) 24 gauge wires and two 18 gauge wires.
4) Accommodate 180 degree door swing.
5) Quick-Connect Plugs: Pre-installed.
4. Wire Harnesses: Of sufficient length, with quick connectors.
a. Wire Harness End Connection to Power Supply or Junction Box: One end with bare leads.

C. Products:
1. Door Position Switches:
a. 9540 Recessed Magnetic Contact/Door Position Switch.
2. Power Supplies:
a. RPSMLR2.
3. Power Transfers:
a. EPT-12C.
4. Wire Harnesses:
a. BEST wire harnesses.

2.16 KEYS AND CORES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
1. Provide small format interchangeable core.
2. Provide Patented CORMAX keys and cores.
3. Provide keying information in compliance with DHI (KSN) standards.
4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
5. Keying: Master keyed.
6. Include construction keying and control keying with removable core cylinders.
7. Supply keys in following quantities:
a. Master Keys: 4 each.
b. Construction Master Keys: 6 each.
c. Construction Keys: 15 each.
d. Construction Control Keys: 2 each.
e. Control Keys if New System: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
   1. Patented:
      a. CORMAX.

2.17 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent 32D), 652; satin chromium plated over nickel, with steel base material (former US equivalent 26D), and 689; aluminum painted, with any base material (former US equivalent US28); BHMA A156.18.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Steel Doors and Frames: See Section 081113.
   3. For Steel Door Frames: See Section 081213.
   4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
   5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   6. Flush Wood Doors: See Section 081416.
   7. Stile and Rail Wood Doors: See Section 081433.
   8. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch (1024 mm).
      b. Push Plates/Pull Bars: 42 inch (1067 mm).
      c. Deadlocks (Deadbolts): 48 inch (1219 mm).
      d. Exit Devices: 40-5/16 inch (1024 mm).
      e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 HARDWARE SETS

Manufacturer List

Code:	Name:
BE	BEST Access Systems
DM	Dorma Door Controls
NA	National Guard
PR	BEST Precision Exit Devices
RC	RCI
ST	BEST Hinges and Sliding
TR	Trimco

Option List

Code:	Description:
B4E	Beveled 4 Edges
CORMAX PATENTED KEYING	Cormax Patented Keying
CSK	Counter Sinking
MLR	Motorized Latch Retraction
RQE	Request to Exit
TS	Touchbar Monitoring Switch

Finish List

Code:	Description:

26D	Satin Chrome
32D	Satin Stainless Steel
626	Satin Chromium Plated
626W	Weatherized Satin Chrome
628	Satin Aluminum, Clear Anodized
630	Satin Stainless Steel
689	Aluminum Painted
BLACK	Black
GREY	Grey
Silver	Silver

Hardware Sets

Set #1
Doors: C105

6	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
2	Manual Flushbolt	3917-12	626	TR
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Coordinator	3094B2	Silver	TR
2	Closer w/ Stop	HD8016 DS	689	BE
2	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Dust Proof Strike	3910	630	TR
2	Mounting Bracket	3095 / 3096 as req'd	Silver	TR
1	Gasketing	110 SA Head & Jambs		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Astragal	139 SP 84"		NA
2	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Coordinate hardware with hollow metal door supplier to ensure the package complies with TDI requirements.

Set #2
Doors: A113, B101A

6	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
1	Removable Mullion	KR822	689	PR
1	Exit Device	MLR TS 2103 X 4903D	626W	PR
1	Exit Device	TS 2102 X 4902D	626W	PR
2	Rim Cylinder	12E-72 PATD CORMAX PATENTED KEYING	626	BE
2	Closer w/ Stop	HD8016 DS	689	BE
2	Power Transfer	EPT-12C		PR
2	Harness	WH-6		ST
2	Harness	WH-6E		ST
2	Harness	WH-192		ST
1	Power Supply	RPSMLR2		PR
2	Position Switch	9540	BLACK	RC
1	Mullion Seal	5100N-86 86"		NA
2	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Seals by storefront door supplier.
Coordinate hardware with storefront door supplier to ensure the package complies with TDI requirements.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in push bar to shunt alarm in access control software for exiting. Free egress at all times.

Set #3
Doors: B136A, A120B, A114A

3	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
1	Exit Device	MLR TS 2103 X 4903D	626W	PR
1	Rim Cylinder	12E-72 PATD CORMAX PATENTED KEYING	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE

1	Power Transfer	EPT-12C		PR
1	Harness	WH-6		ST
1	Harness	WH-6E		ST
1	Harness	WH-192		ST
1	Power Supply	RPSMLR2		PR
1	Position Switch	9540	BLACK	RC
1	Gasketing	110 SA Head & Jambs		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Coordinate hardware with hollow metal door supplier to ensure the package complies with TDI requirements.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in push bar to shunt alarm in access control software for exiting. Free egress at all times.

Set #4
Doors: C100B

3	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Power Transfer	EPT-12C		PR
1	Harness	WH-6E		ST
1	Harness	WH-192		ST
1	Position Switch	9540	BLACK	RC
1	Harness	WH-38		ST
1	Power Supply	DKPS-2A		DM
1	Door Viewer	976	626	TR
1	Gasketing	110 SA Head & Jambs		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Coordinate hardware with hollow metal door supplier to ensure the package complies with TDI requirements.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #4A
Doors: C111

3	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Power Transfer	EPT-12C		PR
1	Harness	WH-6E		ST
1	Harness	WH-192		ST
1	Position Switch	9540	BLACK	RC
1	Harness	WH-38		ST

1	Power Supply	DKPS-2A		DM
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Seals by storefront door supplier.
Coordinate hardware with storefront supplier to ensure the package complies with TDI requirements.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #5
Doors: C115, C116, D100

3	Hinges	FBB191 4.5" x 4.5" NRP	32D	ST
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Gasketing	110 SA Head & Jambs		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Coordinate hardware with hollow metal door supplier to ensure the package complies with TDI requirements.

Set #6
Doors: B130

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Power Transfer	EPT-12C		PR
1	Position Switch	9540	BLACK	RC
1	Power Supply	DKPS-2A		DM
1	Gasketing	110 SA Head & Jambs		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #7
Doors: A100, A104, A108B, A115, B101C, B102, B117A, B117B, A103, B105, B106, B107, C101, C104, C109, A102, C108, B124, A101, A108C, B129, C103, C113

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR

1	Wall Bumper	1270CV	626	TR
1	Power Transfer	EPT-12C		PR
1	Position Switch	9540	BLACK	RC
1	Power Supply	DKPS-2A		DM
3	Silencer	1229A	GREY	TR

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #7A
Doors: A108A

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Power Transfer	EPT-12C		PR
1	Position Switch	9540	BLACK	RC
1	Power Supply	DKPS-2A		DM
3	Silencer	1229A	GREY	TR

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #8
Doors: B101B

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Exit Device	MLR TS 2103 X 4903D	628	PR
1	Rim Cylinder	12E-72 PATD CORMAX PATENTED KEYING	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Power Transfer	EPT-12C		PR
1	Harness	WH-6		ST
1	Harness	WH-6E		ST
1	Harness	WH-192		ST
1	Power Supply	RPSMLR2		PR
1	Position Switch	9540	BLACK	RC
3	Silencer	1229A	GREY	TR

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in push bar to shunt alarm in access control software for exiting. Free egress at all times.

Set #9
Doors: A114B, A120A, A109, A110, A118, A119, A122, A124, B104, B115, C100A, C107, C117

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST

1	Office Lockset	9K3-7A14D PATD CORMAX PATENTED KEYING	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

Set #11
Doors: B122, B123

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Push Plate	1001-3	630	TR
1	Pull Plate	1017-3B	630	TR
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050C Head & Jambs		NA

Set #12
Doors: A111

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Passage Set	9K3-0N14D	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

Set #13
Doors: A105

6	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
2	Manual Flushbolt	3917-12	626	TR
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Coordinator	3094B2	Silver	TR
2	Closer	HD8016 AF80P	689	BE
2	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
2	Wall Bumper	1270CV	626	TR
1	Dust Proof Strike	3910	630	TR
2	Mounting Bracket	3095 / 3096 as req'd	Silver	TR
1	Astragal	139 SP 84"		NA
2	Silencer	1229A	GREY	TR

Set #14
Doors: B121, B138

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Privacy Set	9K3-0L14D	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CSK	630	TR
1	Coat & Hat Hook	3070-1	626	TR
1	Gasketing	5050C Head & Jambs		NA

Set #15
Doors: A107, A117, B108, B111, B112, B127

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Privacy Set	9K3-0L14D	626	BE

1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Coat & Hat Hook	3070-1	626	TR
1	Gasketing	5050C Head & Jambs		NA

Set #16
Doors: B139, B131, B132, B135, B140, B141, B142, B143, B144

3	Butt Hinge	FBB179 4.5" x 4.5" NRP	26D	ST
1	One-Sided Lockset	9K3-7YD14D PATD CORMAX PATENTED KEYING	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
3	Silencer	1229A	GREY	TR

Set #17
Doors: B136C

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Power Transfer	EPT-12C		PR
1	Position Switch	9540	BLACK	RC
1	Power Supply	DKPS-2A		DM
1	Gasketing	110 SA Head & Jambs		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #18
Doors: B136B

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Electromechanical Lock	9KW3-7DEU14D CORMAX PAT'D KEYING C RQE	626	BE
1	Closer w/ Stop	HD8016 DS	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Power Transfer	EPT-12C		PR
1	Position Switch	9540	BLACK	RC
1	Power Supply	DKPS-2A		DM
1	Gasketing	110 SA Head & Jambs		NA
1	Door Sweep	200 SA x Width		NA
1	Threshold	8513 x Width		NA

NOTE: Card reader by access control supplier.
Operational Description: Doors locked at all times. Presenting authorized credentials to reader retracts latch allowing temporary entry.. Key from outside will also provide temporary entry. Request to exit switch in interior lever to shunt alarm in access control software for exiting. Free egress at all times.

Set #19
Doors: B125

3	Butt Hinge	FBB168 4.5" x 4.5"	26D	ST
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050C Head & Jambs		NA

Set #20
Doors: C110, A116, A121, B114, B116, C114

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

Set #21
Doors: B126

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Closer	HD8016 AF80P	689	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050C Head & Jambs		NA

Set #22
Doors: B103

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Storeroom Lockset	9K3-7D14D PATD CORMAX PATENTED KEYING	626	BE
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

Set #GATE
Doors: GATE(4)

1	Exit Device	2108 X 4908D	626W	PR
1	Rim Cylinder	12E-72 PATD CORMAX PATENTED KEYING	626	BE
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR

NOTE: Remainder of hardware by gate supplier.
Coordinate with gate supplier to determine if any additional plates are required to install the exit device.

Opening List

Opening:	Hardware Set:
A100	7
A101	7
A102	7
A103	7
A104	7
A105	13
A107	15
A108A	7A
A108B	7
A108C	7
A109	9
A110	9
A111	12
A113	2
A114A	3
A114B	9
A115	7
A116	20
A117	15
A118	9
A119	9
A120A	9
A120B	3
A121	20
A122	9
A124	9
B101A	2
B101B	8
B101C	7
B102	7
B103	22
B104	9
B105	7
B106	7
B107	7
B108	15
B111	15
B112	15
B114	20
B115	9
B116	20
B117A	7
B117B	7
B121	14
B122	11
B123	11
B124	7
B125	19
B126	21
B127	15
B129	7
B130	6
B131	16

B132	16
B135	16
B136A	3
B136B	18
B136C	17
B138	14
B139	16
B140	16
B141	16
B142	16
B143	16
B144	16
C100A	9
C100B	4
C101	7
C103	7
C104	7
C105	1
C107	9
C108	7
C109	7
C110	20
C111	4A
C113	7
C114	20
C115	5
C116	5
C117	9
D100	5
GATE	GATE

END OF SECTION

SECTION 08 80 00 – GLAZING

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Storefront framing.
   4. Glazed entrances.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain water tight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2015 International Building Code by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures: Provide glazing capable of withstanding a uniform design pressure of inward and outward as indicated on drawings.
   2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
   3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
   4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Impact Resistance: Provide glazing tested per ASTM E1886 to meet the performance requirements of ASTM E1996, Wind Zone 2, Large Missile D.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

C. Product Structural Test Reports

1. Structural-Test & Impact-Test Performance: Based on evaluation of comprehensive tests according to ASTM E 1886, performed by a qualified testing agency, for each type assembly indicating the following:
2. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details for the test specimen (test assembly shall be no smaller in width and length than assembly indicated for use on the Project and shall be installed in same manner as assembly indicated for use on the Project)
3. Impact-Test Performance Results: ASTM E 1996 performance data, signed and sealed by the qualified professional engineer responsible for their preparation, for approved test assembly as described above (test results based on use of downsized test units will not be accepted)

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glass: Obtain clear float glass, tinted float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.

E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

H. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

I. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, de-lamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic-protection testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.
2. Small-Missile Test: For glazing located more than 30 feet (9.1 m) above grade.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 MONOLITHIC-GLASS TYPES

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For uncoated glass, comply with requirements for Condition A.
   3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with the following to comply with interlayer manufacturer's written recommendations:
      a. Polyvinyl butyral interlayer.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.5 GLAZING GASKETS

A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC-GLASS TYPES

A. Glass Type GL-2 (1/4" Tempered Glass) – At all interior glazing:

Clear fully tempered float glass. Provide at all interior glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

2.9 LAMINATED-GLASS TYPES

A. Glass Type GL-4 (9/16" Tinted Laminated Glass) – At all exterior glazed doors:

Tinted laminated glass with two plies of fully tempered float glass with outer ply Class 2 (tinted) and inner ply Class 1 (clear). Provide at all exterior entrance doors.

1. Outer Ply: 6.0 mm.
    a. Solarban 70 Solar Control Low-E Glass on Azuria Low E #2 by Vitro Glass
2. Interlayer Thickness: 0.090 inch (1.52 mm).
3. Inner Ply: 6.0 mm
    a. Clear
4. Provide safety glazing labeling.

2.10 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type GL-1 (1 5/16" Insulating-Laminated Glass) – At all exterior glazed storefronts except for window type H on Sheet A-500:

Low-e-coated, tinted, insulating laminated glass. Provide at all exterior glass location except for exterior entrance doors.

1. Overall Unit Thickness: 1-5/16 inch.
2. Thickness of Outdoor Lite: 6.0 mm.
3. Outdoor Lite: Tinted fully tempered float glass.
    a. Solarban 70 Solar Control Low-E Glass on Azuria Low E #2 by Vitro Glass
4. Interspace Content: Air.
5. Indoor Lite: Clear laminated glass with two plies of fully tempered float glass.
    a. Thickness of Each Glass Ply: 6.0 mm.
    b. Interlayer Thickness: 0.090 inch (1.52 mm).
6. Low-E Coating: Pyrolytic on second surface.
7. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

SECTION 088853 - SECURITY GLAZING

1.1 SUMMARY

A. Security glazing for security vestibule's interior glazed aluminum entrances, security vestibule's interior glazed aluminum storefront (GL-3).

1.2 QUALITY ASSURANCE

A. Mockups: Security glazing installed in mockups.

1.3 SUBMITTALS

A. Product data.

B. Samples:

1.4 WARRANTY

A. Laminated Polycarbonate: 10 years.

B. Glass-Clad Polycarbonate: 10 years.

1.5 GLASS-CLAD POLYCARBONATE SECURITY GLAZING SCHEDULE

A. **Glass-Clad Polycarbonate Security Glazing (GL-3)**: 7/8" Armor-Gard BALULN21 glass-clad polycarbonate glazing system by Insulgard Security Products, or equal product.

1. Ballistic Resistance: **Level 1** per UL 752.
2. Color: Clear.
3. Other: Polycarbonate mar-resistant surface on classroom side.

END OF SECTION 08 88 53

SECTION 08 91 19 - FIXED LOUVERS

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. Fixed, extruded-aluminum louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

2. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.

3. Wind Loads: Determine loads based on pressures indicated below:

a. Corner Zone: uniform pressure, acting inward, and, acting outward as indicated on drawings.

b. Other Than Corner Zone: uniform pressure, acting inward, and, acting outward as indicated on drawings.

B. Windborne-Debris-Impact Resistance: Louvers located within 30 feet (9.1 m) of grade shall pass basic-protection, large-missile testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Wind-Driven-Rain-Resistant Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties Inc., C/S 6” (152.6mm) High Performance Drainable Fixed Mullion Louver Model A6177, or comparable product by one of the following:

a. Airolite Company, LLC (The).

b. Greenheck Fan Corporation.

c. Ruskin Company; Tomkins PLC.

3. Louver Depth: 6 inches (150 mm).

4. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and 0.080 inch (2.03 mm) for frames.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

6. Coordinate louvers in Insulated Core Metal Wall Panels with manufacturer of Insulated Core Metal Wall Pnaels.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.

2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.

2. Finish: Same finish as louver frames to which louver screens are attached.

3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.

2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Post-installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.

F. Provide subsills made of same material as louvers for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

a. Louvers in Insulated Core Metal Wall Panels, Match color and gloss of Insulated Core Metal Wall Panels

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather tight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weather tight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior non-load-bearing wall studs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.0313 inch (0.794 mm)].
   b. Depth: As indicated on Drawings.
2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.0313 inch (0.794 mm)].
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

D. Fire stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Fire Trak Corp.; Fire Trak System[attached to studs with Fire Trak Posi Klip].
   b. Grace Construction Products; FlameSafe FlowTrak System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0313 inch (0.794 mm).
2. Depth: 7/8 inch (22.2 mm).

H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm).
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm) or as required for design.

D. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
a. Minimum Base-Metal Thickness: 0.0313 inch (0.794 mm).

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor

plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.

2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.

2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.

3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb unless otherwise indicated.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Fire stop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:

a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
a. Size supplemental suspension members and hangers to support ceiling loads within [performance limits established by referenced installation standards] <Insert deflection limit>.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 24 00 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior portland cement plasterwork on metal lath.
2. Exterior portland cement plasterwork (stucco) on metal lath.

B. Related Sections:

1. Section 092216 "Non-Load-Bearing Steel Framing" for non-structural framing and suspension systems that support lath and portland cement plaster.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Before plastering, install mockups of at least 100 sq. ft. (9.3 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for each type of finish indicated.
2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F (4.4 deg C) for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

C. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    b. Dietrich Metal Framing; a Worthington Industries company.
2. Diamond-Mesh Lath: Flat, 2.5 lb/sq. yd. (1.4 kg/sq. m) 3.4 lb/sq. yd. (1.8 kg/sq. m).
3. Flat Rib Lath: Rib depth of not more than 1/8 inch (3.1 mm), 3.4 lb/sq. yd. (1.8 kg/sq. m).

2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    b. Dietrich Metal Framing; a Worthington Industries company.
2. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
    a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
    b. Small nose cornerbead with perforated flanges; use on curved corners.
    c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
3. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
4. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

F. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

2.4 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

C. Sand Aggregate: ASTM C 897.

D. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
1. Products: Subject to compliance with requirements, available products that may be incorportated in the work include but are not limited to:
    a. Dryvit Systems, Inc.; Dryvit TAFS.
    b. Sto Corp.; Powerwall Finish.
2. Color: Match Architect sample.

2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.

b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

1. Partition Framing and Vertical Furring: Install flat rib lath.

2. Curved-Ceiling Framing: Install flat diamond-mesh lath.

3.4 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install cornerbead at interior and exterior locations.

C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).

b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).

2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.

3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.

4. Where control joints occur in surface of construction directly behind plaster.

5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.

2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 inch (13 mm) thick.

1. Portland cement mixes.

C. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

D. Concealed Interior Plasterwork:

1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.

3.6 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Texture finishes.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
3. Section 093000 "Tiling" for cementitious backer units installed as substrates for ceramic tile and base of gypsum board walls.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, 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 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following]:

1. CertainTeed Corp.
2. Georgia-Pacific Gypsum LLC.
3. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Pre-filling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. 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.

1. Products: Subject to compliance with requirements, [provide one of the following]:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
   b. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.

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

a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.

b. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.

2. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

1. Control joints shall be located 30 feet-0 inches on center maximum and along building expansion joints, unless noted otherwise on drawings. Locations shall be reviewed with Architect prior to final placement.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.

2. Type X: Where required for fire-resistance-rated assembly.

3. Moisture- and Mold-Resistant Type: As indicated on Drawings.

4. Cementitious backer panels: Install minimum 3” base at all gypsum walls.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:
1. Corner bead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Control Joint: Maximum 30’-0” on center or as noted on drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Pre-fill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    a. Primer and its application to surfaces are specified in Section 099113 "Painting."

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - TILING

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. Ceramic tile.
2. Stone thresholds.
3. Waterproof membrane.
4. Crack isolation membrane.
5. Tile backing panels.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

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

B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

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

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Ceramic Tile Type CT-#1: Factory-mounted unglazed ceramic mosaic tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crossville, Inc.; Soho Patterned Mosaics or comparable product.
2. Composition: Porcelain.
3. Module Size: 1 by 1 inch Hex.
4. Tile Color and Pattern:
   a. Canvas white with soft sage.
   b. Canvas white with cloud blue.
5. Grout Color: As selected by Architect from manufacturer's full range.
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

A. Tile Type CT-2: Wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crossville, Inc.; Soho or comparable product.
2. Module Size: 8 by 24 inches.
7. Tile Color and Pattern:
   a. Canvas white.
3. Grout Color: As selected by Architect from manufacturer's full range.
4. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

B. Tile Type CT-3: Floor tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crossville, Inc.; Slipstream or comparable product.
2. Module Size: 12 by 24 inches.
8. Tile Color and Pattern:
   a. Gray.
3. Grout Color: As selected by Architect from manufacturer's full range.
4. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
   1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board with Water-Resistant Coating: ASTM C 1178/C 1178M.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Gypsum LLC; "DensShield Tile Backer" or a comparable product by another manufacturer.
   2. Core: 1/2 inch (12.7 mm), regular type.
   3. Long Edges: Square.

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
      b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
      c. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
      d. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Building Products.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.
   2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
   3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Polymer-Modified Tile Grout: ANSI A118.7.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bonsal American; an Oldcastle company.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
   2. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."
   1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
   c. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Glazed Wall Tile: 1/16 inch (1.6 mm).

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
2. Do not extend cleavage membrane, waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane, waterproofing or crack isolation membrane with elastomeric sealant.

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].

K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR TILE INSTALLATION SCHEDULE - FLOORS

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.
   a. Tile Type: CT-3.
   b. Thin-Set Mortar: Latex-portland cement mortar.
   c. Grout: Polymer-modified sanded grout.

B. Interior Floor Installations, Wood Subfloor:

9. Ceramic Tile Installation: TCNA F144; thinset mortar water-cleanable epoxy adhesive on waterproof membrane over cementitious backer units or fiber-cement backer board.
   a. Ceramic Tile Type: CT-3.
   b. Thinset Mortar: Latex-portland cement mortar.
   c. Grout: High-performance sanded grout.

3.8 INTERIOR TILE INSTALLATION SCHEDULE - WALLS

A. Interior Wall Installations, Masonry or Concrete:

1. Tile Installation W202: Thin-set mortar; TCA W202.
   a. Tile Type: CT-2.
   b. Thin-Set Mortar: Latex-portland cement mortar.
   c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W245: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board; TCA W245.
   a. Tile Type: CT-2.
   b. Thin-Set Mortar: Latex-portland cement mortar.
   c. Grout: Polymer-modified sanded grout.

3.9 INTERIOR TILE INSTALLATION SCHEDULE – SHOWERS

A. Shower Receptor and Wall Installations:

1. Ceramic Tile Installation: TCNA B415 and ANSI A108.1C; cement mortar bed (thickset) over vapor-retarder membrane.
   a. Ceramic Tile Type: CT-1 on floors.
   b. Ceramic Tile Type: CT-2 on walls.
   c. Bond Coat for Wet-Set Method: Modified dry-set mortar.
   d. Grout: Polymer-modified sanded grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.
7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
8. Minimum Drawing Scale: 1/8 inch = 1 foot .

B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency .

C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions; Fine Fissured, # 1728 lay-In or comparable product by one of the following:

1. Certainteed; SAINT-GOBAIN.
2. USG Corporation.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Classification: Provide panels as follows:

1. Type and Form: Type III, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face.
2. Pattern: CE, Perforated, small holes.

D. Color: White.

E. Light Reflectance (LR): Not less than 0.82.

F. Ceiling Attenuation Class (CAC): Not less than 35.

G. Noise Reduction Coefficient (NRC): Not less than 0.55.

H. Edge/Joint Detail: Square.

I. Thickness: 5/8 inch.

J. Modular Size: 24 by 24 inches.

K. Sag Resistance: HumiGuard

L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions; Prelude Plus XL aluminum or comparable product by one of the following:

1. Certainteed; SAINT-GOBAIN.
2. USG Corporation.
3. Armstrong Ceiling & Wall Solutions.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

C. Wide-Face, Capped, Double-Web, Aluminum Suspension System: Aluminum main and cross runners; with prefinished 15/16-inch- wide aluminum caps on flanges.

1. Structural Classification: light-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: aluminum.
5. Cap Finish: Painted white.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
   a. Type: anchors.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
   3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
   4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

C. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

D. Hold-Down Clips: Manufacturer's standard hold-down.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
   1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
   b. Install panels with pattern running in one direction parallel to short axis of space.
   c. Install panels in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
   a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet , non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet , non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Thermoplastic-rubber base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Product Data: For sealants, indicating VOC content.
   4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For resilient base and stair products and accessories, indicating compliance with requirements for low-emitting materials.
   6. Environmental Product Declaration: For each product.
C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
D. Samples for Initial Selection: For each type of product indicated.
E. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
F. Product Schedule: For resilient base and accessory products.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Coordinate mockups in this Section with mockups specified in other Sections.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive resilient products during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOPLASTIC-RUBBER BASE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite; a Tarkett company; Johnsonite Millwork Wall Finishing System, Inflection or comparable product by one of the following:
   1. Armstrong Flooring, Inc.
   2. Nora by Interface.
   3. Roppe Corporation.
   4. Johnsonite; a Tarkett company.
B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
   1. Group: I (solid, homogeneous) .
   2. Style and Location:
      a. Style D, Sculptured: Provide in areas indicated.

1) Profile: Inflection.

C. Thickness: 0.375 inch.
D. Height: 5.25 inches.
E. Lengths: Cut lengths 96 inches long.
F. Outside Corners: Preformed.
G. Inside Corners: Preformed.
H. Colors: Match Architect's sample.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Verify adhesives have a VOC content of 50 Insert value> g/L or less and 60 g/L or less for rubber stair treads.
C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.
H. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.
B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
B. Perform the following operations immediately after completing resilient-product installation:
1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.
C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
1. Apply three coat(s).
E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 09 69 00 – ACCESS FLOORING

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.
SUMMARY

B. This Section includes the following:
   1. Interchangeable access-flooring panels
   2. Understructure
   3. Labor, material, equipment and installation as per specifications and/or shown on the Architect's drawings.
   Related Sections include the following:
   4. Section 03 30 00 – Concrete work and concrete floor sealer
   5. Section 26 05 00 – Electrical connections and grounding

1.2 PERFORMANCE REQUIREMENTS

A. Provide access flooring system consisting of moveable assemblies composed of modular floor panels supported on pedestals forming accessible under floor cavities to accommodate electrical and mechanical, services which comply with performance requirements specified. Raised floor panels must be interchangeable with each other except where cut for special conditions.

B. Where applicable load testing shall be performed according to "Recommended Test Procedures for Access Flooring" as established by the Ceiling and Interior Systems Construction Association (CISCA). These procedures shall be used as a guideline when presenting load performance product information.
   1. Concentrated Load: 1,250 lb. on one square inch (25mm) at any location with a top surface deflection not to exceed 0.10" (2.5mm), and a permanent set not to exceed .010" (.25mm).
   2. Uniform Load: With a top surface deflection not exceeding 0.040" (1mm), floor can hold 600 pounds per square foot evenly distributed over the surface of the panel with a permanent set not exceeding 0.010" (0.25mm).
   3. Ultimate Load: Panel shall be designed to withstand a load of 1800 lb. applied over one inch at the weakest point on a pedestal.
   4. Rolling Load: Panels shall withstand a rolling load of 1,300 lbs. applied through a 3" (76mm) dia. x 1-13/16" (46mm) wide caster for 10 cycles over the same path with a maximum of .040" (1mm) top surface permanent set. Panels shall withstand a rolling load of 900 lb. applied through a hard rubber-surfaced wheel 6" (152mm) dia. x 2" (51mm) wide for 10,000 cycles over the same path with a maximum of .040" (1mm) top surface permanent set.
   5. Impact Load: A 150 lb. load dropped from 36"(914mm) onto a one-inch square indenter shall not render the system unserviceable.
   6. Flammability: Bare panel system shall meet Class A requirements for Flame spread and smoke development when tested in accordance with ASTM-E84 and a maximum Flame spread of 25, Smoke development of 50 based on the average of three runs when tested in accordance with CAN/ULC S102.
   7. Combustibility: All components of the access floor system shall qualify as noncombustible by demonstrating compliance with requirements of ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
   8. Recycled Content: Panel and understructure system shall be required to have a minimum recycled content of 50%.
   9. Pedestal Axial Load Test: Provide pedestal assemblies without panels or other supports in place, capable of withstanding a 6000 lb. (22 240 N) Axial load per pedestal, according to CISCA A/F, Section 5 "Pedestal Axial Load Test."
   10. Verify requirements for pedestal overturning moment in seismic zones with authorities having jurisdiction. Coordinate with pedestals selected in Part 2 and method of attachment specified.
   11. Pedestal Overturning Moment Test: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding an average overturning moment of 1000 in*lbs. (113 N*m) when bonded to clean concrete slab according to CISCA A/F, Section 6, "Pedestal Overturning Moment Test."

C. Product testing shall be witnessed and certified by an accredited independent engineering and testing laboratory based in the U.S.A. with a minimum of five (5) years' experience testing access floor components in accordance with CISCA test methods.

1.3 SUBMITTALS

A. Submit a sample of the floor panel and each understructure component.
B. Shop Drawings:
1. Submit drawings showing raised floor panel layout including starting point of installation.
2. Include details of component panels and pedestals. If required show edge details of ramps, steps, handrails and anchoring of pedestal bases to subfloor.
C. Product Certificates:
1. Submit independent testing organization certificates indicating compliance with specified design criteria when tested and reported according to CISCA “Recommended Test Procedures for Access Floors.”

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications:
1. Access floor manufacture shall be ISO9001:2015 certified demonstrating it has a robust and well documented quality management system with continual improvement goals and strategies.
2. Access floor manufacturer’s facilities shall be ISO14001:2015 certified demonstrating that they maintain an environmental management system.
B. Installer Qualifications: Engage an experienced installer with minimum of 5 years’ experience in the installation of access floor systems of comparable size and complexity.
C. Access Floor Tolerances:
1. Manufacturing Tolerance:
a. Nominal panel size: ± 0.015" (.4mm) or less.
b. Panel flatness: ± 0.020" (.5mm) or less.
c. Panel squareness: ± 0.015" (.4mm) or less.
d. Panel interchangeability: All panels, except those modified to meet special conditions, shall be interchangeable.
2. Installation Tolerance:
a. Finished installation shall be level within ± 0.060" (2mm) in 10 feet (3m) and ± 0.100" (3mm) for the entire floor.

1.5 DELIVERY STORAGE AND HANDLING
A. Deliver flooring components clearly labeled with manufacturer’s name and item description.
B. Handle and store packages containing flooring in a manner which avoids overloading building structure.
C. Provide a dry accessible area to receive and unload material with a free path to elevators, hoists and/or the area receiving the floor.
D. The subfloor shall be free of moisture, dust, dirt and other debris. Once installed, the tile floor must be maintained in the same manner.

1.6 PROJECT CONDITIONS
A. Provide a clean, level, dry subfloor, temperature controlled, and protected from the weather.
B. Access flooring storage and installation areas shall be maintained at a temperature between 40°F to 120°F and be less than 70% relative humidity for 24 hours a day before, during and after installation.
C. Overhead construction work must be completed before installing access floor to avoid damage to panels and finishes.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Basis-of-Design Product: Subject to compliance with requirements, provide Global IFS; TecCrete Access Flooring or comparable product.

2.2 MATERIALS
A. Floor Panels: TecCrete 1250lb. Panels shall be integrated steel pan construction with exposed top surface of lightweight concrete fill. Floor Panels are bare cornerlock.
1. Panels shall be nominal 24” (610mm) x 24” (610mm) x 1-1/8” (29mm) or 1-1/2” (38mm) deep, manufactured with galvannealed steel pan having shear tabs that integrally bond to the lightweight, high-strength concrete fill. Panel corners shall be manufactured to receive the pedestal head positioning dome. Each panel shall accept a flush-fit metal fastener which securely fastens each panel corner to the pedestal head.
2. Panel Finish: Floor panel surface shall be factory standard bare concrete for field installed carpet tile. Panels shall have a maximum electrical resistance of 10 ohms or less from the top edge of the panel, less surface covering, to the understructure.
B. Understructure:

1. Pedestal assemblies shall be of hot-dip galvanized steel.
2. The base shall be a minimum of 16 square inches and shall be stamped and/or embossed on its underside and shall be adhered to the sub floor with an adhesive recommended by the access flooring manufacturer.
3. Where mechanical anchors are required for seismic zones, provide same as required by project specific seismic calculations.
4. The threaded stud shall be 3/4" (19mm) diameter steel.
5. The head assembly shall be designed so that the panels will be held in place with or without cornerlock fasteners.
6. Pedestal assembly shall provide an adjustment range of +/- 1” (25mm) when finished floor height is 6” (152mm) or more, adjustable at 1/64" (.4mm) increments.
7. The assembly shall provide a mechanical means to lock the floor in a level plane and adjustments shall be capable of being made without special tools.
8. For cornerlock system, the head of the all-steel assembly shall be designed to accept a metal fastener to mechanically lock the panels in place.
9. Pedestal assembly shall support not less than 6,000 lb. axial load and shall resist an average 1,000 inch-pound overturning moment when bonded to a clean concrete slab.

C. Accessories:
1. Furnish ramps, steps, lateral bracing, fascia, handrails, cutouts and miscellaneous items where indicated.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the subfloor which is to receive access flooring for dryness, cleanliness, unevenness, or any irregularities that will affect the quality of the access flooring.
1. Verify that material storage and installation areas are at recommended temperature and relative humidity before, during and after installation.
2. Verify that access floor is level to within 1/8” (3mm) in 10 feet (3m).

B. Do not commence installation of access flooring until subfloor is clean and dry, temperature controlled, and protected from the weather.

3.2 INSTALLATION

A. Pedestal locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with pedestal locations.

B. Cut edges of panels shall be sealed with compressible neoprene gasketing to prevent Category 2 Leakage.

C. Installer is to coordinate with other trades to maintain the integrity of the installed access flooring. All traffic on access floor shall be controlled by the installer only. No traffic other than the access floor installation crew shall be permitted on any floor area for 48 hours to allow the pedestal adhesive to set. Access floor panels shall not be removed by other trades for 72 hours after their installation.

D. Floor system and accessories shall be installed by an authorized factory trained installation company with a minimum of five (5) years’ experience.

E. No dust or debris producing operations by other trades shall be allowed in areas where access floor is being installed to ensure proper bonding of pedestals to subfloor.

F. Installer shall keep the subfloor broom clean as installation progresses.

G. Finished installation shall be level within +/- 0.060” (2mm) in 10 feet (3m) and +/- 0.100” (3mm) for the entire floor area.

H. Replace damaged materials prior to the application of field applied surfaces.

I. Assure compatibility between the concrete sealer and the pedestal adhesive provided by the access floor manufacturer.

3.3 ACCEPTANCE

A. Protect the access floor and accessories from damage, contamination or overloading.

B. Provide underfloor cleaning.

END OF SECTION 096900

SECTION 09 91 13 - PAINTING

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 this section.

1.2 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Prefinished items not to be painted include the following factory-finished components:
    a. Architectural woodwork and casework.
    b. Finished mechanical and electrical equipment.
    c. Light fixtures.
    d. Switchgear.
    e. Distribution cabinets.
2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
    a. Foundation spaces.
    b. Furred areas.
    c. Utility tunnels.
    d. Pipe spaces.
3. Finished metal surfaces not to be painted include:
    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper.
    e. Bronze.
    f. Brass.
4. Operating parts not to be painted include moving parts of operating equipment such as the following:
    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.
5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
3. Division 6 Section "Architectural Woodwork" for shop priming architectural woodwork.
4. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
5. Division 9 Section "Special Coatings" for special coatings.

1.3 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.4 SUBMITTALS

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.

1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

2. VOC content.

C. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

1. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.

2. Submit samples on the following substrates for the Architect's review of color and texture only:

a. Concrete: Provide two 4-inch-square samples for each color and finish.

b. Concrete Masonry: Provide two 4- by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.

c. Painted Wood: Provide two 12- by 12-inch samples of each color and material on hardboard.

d. Stained or Natural Wood: Provide two 4- by 8-inch samples of natural and stained wood finish on actual wood surfaces.

e. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of problems anticipated using the materials specified.

C. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full- coat finish samples on at least 100 sq. ft. of surface until required sheen, color and texture are obtained; simulate finished lighting conditions for review of in-place work.

1. Final acceptance of colors will be from job-applied samples.

2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface in accordance with the schedule or as specified. After finishes are accepted, this room or surface will be used for evaluation of coating systems of a similar nature.

D. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.

2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.

3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.

E. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.

2. Nonflat Paints and Coatings: 150 g/L.

3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Federal Specification number, if applicable.
4. Manufacturer's stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
1. Benjamin Moore and Co. (Moore).
2. Pratt and Lambert (P & L).
3. The Sherwin-Williams Company (S-W).

2.2 MASONRY BLOCK FILLER

A. High-Performance Latex Block Filler: Heavy-duty latex block fillers used for filling open textured interior and exterior concrete masonry block before application of top coats:
1. S-W: Prep Rite Block Filler B25W25.

2.3 PRIMERS

A. Exterior Primer Coating: Exterior latex wood primer used for priming mineral-fiber-reinforced cement panels under a flat acrylic emulsion finish:
1. S-W: Exterior Latex Primer

B. Interior Masonry Latex-Based Paint: Alkali-resistant paint used as a primer over concrete and masonry under flat and semigloss enamel:
1. S-W: Loxon Concrete & Masonry Primer, A24W8300.

C. Interior Flat Latex-Based Paint: Flat latex paint used as a primer on plaster under flat, semigloss, and full-gloss alkyd finishes:
   1. S-W: Premium Wall and Wood Primer, B28W8111.

D. Latex-Based Interior White Primer: Latex-based primer coating used on interior gypsum drywall under a flat latex paint or an alkyd semigloss enamel.
   1. S-W: Pro Green 200 Latex Wall Primer.

E. Synthetic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semigloss or alkyd gloss enamels:
   1. S-W: Pro Cryl Universal Metal Primer B66W310.

F. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:
   1. S-W: Pro Cryl Universal Metal Primer B66W310.

2.4 UNDERCOAT MATERIALS

A. Interior Enamel Undercoat: Ready-mixed enamel for use on the interior as an undercoat over a primer on filled concrete masonry under an odorless semigloss enamel finish:
   1. S-W: Premium Wall & Wood Primer, B28W8111.

B. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over wood and hardboard under an odorless alkyd semigloss enamel or full gloss alkyd enamel:
   1. S-W: Premium Wall & Wood Primer, B28W8111.

C. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer on ferrous or zinc-coated metal under an interior alkyd semigloss enamel or a full-gloss alkyd enamel:
   1. S-W: Premium Wall & Wood Primer, B28W8111.

2.5 EXTERIOR FINISH PAINT MATERIAL

A. Exterior Acrylic Emulsion: Quick-drying, flat, acrylic paint for use on the exterior over concrete, stucco, masonry (including concrete masonry block), and mineral-fiber-reinforced cement-panel surfaces:
   1. S-W: A-100 Acrylic Latex Flat Exterior Finish A- 6 Series.

B. Exterior Semi-transparent Oil Stain: Semi-transparent oil based exterior wood stains:
   1. S-W: WoodScapes Semi-Transparent Polyurethane Exterior Stain (A15T5).

C. Exterior Full-Gloss Enamel: Full-Gloss Alkyd enamel for use over prime-coated ferrous metal:
   1. S-W: Industrial Alkyd Urethane B54W150.

2.6 INTERIOR FINISH PAINT MATERIAL

A. Latex-Based Interior Semi-Gloss Paint: Ready-mixed, latex-based paint for use as a semi gloss finish over concrete and masonry surfaces, including filled concrete masonry block, mineral-fiber-reinforced cement panels, and plaster and over prime-coated gypsum drywall, ferrous metal, and zinc-coated (galvanized) metal surfaces:
   1. S-W: Pro Mar 200 Zero VOC Semigloss Wall Paint.

B. Interior Semigloss Odorless Acrylic Paint: Ready-mixed, low-odor interior semigloss acrylic enamel for use over concrete, masonry, and plaster wood, hardwood, gypsum drywall, and metal surfaces:
   1. S-W: Pro Industrial 0 VOC Acrylic Eg-Shell.

C. Latex-based, Interior Flat Paint: Ready-mixed, latex based paint for use over acoustical plaster surfaces and as a "size" on cotton or canvas covering over insulation:
   1. S-W: Pro Mar 200 Zero VOC Flat Wall Paint, B30W2600 Series.

D. Exposed Steel Roof Structure and Acoustical Tectum Panels: 2 coats with total dry film thickness not less than 4 mils.
   1. First Coat: S-W Low VOC Waterborne Acrylic Dryfall, B42W00081.
   2. Second Coat: S-W Low VOC Waterborne Acrylic Dryfall, B42W00081.

2.7 MISCELLANEOUS WOOD FINISHING MATERIALS

A. Varnish-Type Surface Sealer: Sealer for open-grain wood for use as a surface sealer over exterior plywood before application of a prime coat:
   1. S-W: A-100 Exterior Latex Primer.

B. Oil-Type Interior Wood Stain: Slow-penetrating oil-type wood stain for general use on interior wood surfaces under varnishes or wax finishes:
   1. S-W: S-W Minwax Low VOC Waterborne Stain.

C. Waterborne Varnish: Clear, oil-type rubbing varnish for use on interior stained or natural-finished woodwork:

1. S-W: S-W Minwax Polyurethane Varnish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, and rinse; allow to dry and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

c. When transparent finish is required, backprime with spar varnish.

d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.

e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

4. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

a. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10.

b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

D. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in "schedules."

2. Provide finish coats that are compatible with primers used.

3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.

8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

9. Finish interior of wall and base cabinets and similar field- finished casework to match exterior.

10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

11. Sand lightly between each succeeding enamel or varnish coat.

12. Omit primer on metal surfaces that have been shop-primed and touch up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

F. Mechanical items to be painted include but are not limited to:
   1. Piping, pipe hangers, and supports.
   2. Heat exchangers.
   3. Tanks.
   4. Ductwork.
   5. Insulation.
   6. Supports.
   7. Motors and mechanical equipment.
   8. Accessory items.

G. Electrical items to be painted include but are not limited to:
   1. Conduit and fittings.
   2. Switchgear.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
   1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
   1. The Owner will engage the services of an independent testing laboratory to sample the paint material being used. Samples of material delivered to the project will be taken, identified, sealed, and certified in the presence of the Contractor.
   2. The testing laboratory will perform appropriate tests for the following characteristics as required by the Owner:
      a. Quantitative materials analysis.
      b. Abrasion resistance.
      c. Apparent reflectivity.
      d. Flexibility.
      e. Washability.
      f. Absorption.
      g. Accelerated weathering.
      h. Dry opacity.
      i. Accelerated yellowness.
      j. Recoating.
      k. Skinning.
      l. Color retention.
      m. Alkali and mildew resistance.
   3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are noncompatible.

3.5 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates indicated.

B. Ferrous Metal: Primer is not required on shop-primed items.

1. Lusterless Alkyd Enamel: 2 finish coats over primer.
   a. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
   b. First Coat: Lusterless Alkyd Enamel (FS TT-E-527).
   c. Second Coat: Lusterless Alkyd Enamel (FS TT-E-527).

C. Zinc-Coated Metal:

1. Lusterless Alkyd Enamel: 2 finish coats over primer.
   a. Primer: Galvanized Metal Primer (FS TT-P-641).
   b. First Coat: Alkyd Gloss Enamel (FS TT-E-489).
   c. Second Coat: Alkyd Gloss Enamel (FS TT-E-489).

3.8 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Concrete and Masonry (Other than concrete masonry units):

1. Semi-gloss Enamel Finish: 3 coats with total dry film thickness not less than 3.5 mils.
   a. Primer: Latex-Based Interior Flat Paint (FS TT-P-29).
   b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
   c. Finish Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

C. Concrete Masonry Units:

1. Semi-gloss Alkyd Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.
   a. Block Filler: High Performance Latex Block Filler.
   b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
   c. Finish Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

D. Gypsum Drywall Systems:

1. Odorless semi-gloss Alkyd Enamel Finish: 3 coats with total dry film thickness not less than 2.5 mils.
   a. Primer: Interior Latex-Based White Primer (FS TT-P-650).
   b. First Coat: Interior Egg-Shell Odorless Alkyd Enamel (FS TT-E-509).
   c. Second Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

E. Woodwork and Hardboard:

1. Semigloss Enamel Finish: 3 coats.
   a. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
   b. First Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).
   c. Second Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

F. Stained Woodwork:

1. Stained-Varnish Rubbed Finish: 3 finish coats over stain plus filler on open-grain wood. Wipe filler before applying first varnish coat.
   a. Stain Coat: Oil-Type Interior Wood Stain (FS TT-S-711).

b. First Coat: Cut Shellac (FS TT-S-300).
c. Filler Coat: Paste Wood Filler (FS TT-F-336).
d. Second Coat: Oil Rubbing Varnish (FS TT-V-86).
e. Third Coat: Oil Rubbing Varnish (FS TT-V-86).

G. Ferrous Metal:
1. Lusterless (Flat) Finish: 2 finish coats over primer with total dry film thickness not less than 2.5 mils.
a. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
b. First Coat: Latex-Based Interior Flat Paint (FS TT-P-29).
c. Second Coat: Latex-Based Interior Flat Paint (FS TT-P-29).
2. Semigloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.
a. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
c. Finish Coat: Interior semigloss Odorless Alkyd Enamel (FS TT-E-509).

H. Zinc-Coated Metal:
1. Lusterless (Flat) Finish: 2 finish coats over primer with total dry film thickness not less than 2.5 mils.
a. Primer: Galvanized Metal Primer (FS TT-P-641).
b. First Coat: Latex-Based Interior Flat Paint (FS TT-P-29).
c. Second Coat: Latex-Based Interior Flat Paint (FS TT-P-29).
2. Semigloss Finish: 2 coats over primer, with total dry film thickness not less than 2.5 mils.
a. Primer: Galvanized Metal Primer (FS TT-P- 641).
b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
c. Finish Coat: Interior semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

END OF SECTION 099113

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance coating systems .
   1. Exterior Substrates:
      a. Concrete, surfaces.
      b. Concrete masonry units (CMUs).
      c. Portland cement plaster (stucco).
   2. Interior Substrates:
      a. Concrete, vertical surfaces.
      b. Concrete masonry units (CMUs).
      c. Gypsum board.
      d. Plaster.

B. Related Requirements:
   1. for shop priming of structural steel with primers specified in this Section.
   2. Section 055213 "Pipe and Tube Railings" for shop pipe and tube railings with coatings specified in this Section.
   3. Section 099113 "Exterior Painting" for general field painting.
   4. Section 099123 "Interior Painting" for general field painting.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
      a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); Ceramic Carpet #400, Decorative Broadcast or comparable product by one of the following:
B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.
C. Colors: As selected by Architect from manufacturer's full range As indicated in color schedule .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.
C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
D. Plaster Substrates: Verify that plaster is fully cured.
E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.

E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer .

1. SSPC-SP 7/NACE No. 4.
2. SSPC-SP 11.
3. SSPC-SP 6/NACE No. 3.
4. SSPC-SP 10/NACE No. 2.
5. SSPC-SP 5/NACE No. 1.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer that is recommended in writing by topcoat manufacturer for coating system indicated.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with filler that is recommended in writing by topcoat manufacturer for coating system indicated. Sand smooth when dried.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

1. Epoxy System MPI EXT 4.2E:
    a. Block Filler: Block filler, epoxy , MPI #116.
        1) **<insert manufacturer's name; product name or designation>**.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss [**, MPI #77**].
        1) **<insert manufacturer's name; product name or designation>**.

B. Portland Cement Plaster Substrates:

1. Epoxy System [**MPI EXT 9.1D**]:
    a. Prime Coat: Epoxy, matching topcoat.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss [**, MPI #77**].
        1) **<insert manufacturer's name; product name or designation>**.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy System [**MPI INT 3.1F**]:
    a. Prime Coat: Epoxy, matching topcoat.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss [**, MPI #77**].
        1) **<insert manufacturer's name; product name or designation>**.

B. CMU Substrates:

1. Epoxy System MPI INT 4.2G:
    a. Block Filler: Block filler, epoxy [**, MPI #116**].
        1) **<insert manufacturer's name; product name or designation>**.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss [**, MPI #77**].
        1) **<insert manufacturer's name; product name or designation>**.

C. [**Gypsum Board**] [**Plaster**] Substrates:

1. Epoxy System [**MPI INT 9.2E**]:
    a. Prime Coat: Primer sealer, latex, interior [**, MPI #50**].
        1) **<insert manufacturer's name; product name or designation>**.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss [**, MPI #77**].
        1) **<insert manufacturer's name; product name or designation>**.

END OF SECTION 099600

SECTION 101416 - PLAQUES

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 plaques.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plaques.

1. Include fabrication and installation details and attachments to other work.
2. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each plaque at least half size.

C. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.

D. Plaque Schedule: Use same designations specified or indicated on Drawings or in a plaque or sign schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For plaques to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PLAQUES

A. Cast Plaque – BP1: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Corpus Christi Stamp Works, Inc. or comparable product by one of the following:
   a. A.R.K. Ramos.
   b. Gemini Incorporated.
   c. Southwell Company (The).
2. Plaque Material: Cast brass.
3. Size: 24 inch X 24 inch.
4. Plaque Thickness: 0.5 inch.
5. Finishes:
   a. Integral Metal Finish: Polished finish raised surface with painted color background.
   b. Overcoat: Manufacturer's standard baked-on clear coating.
6. Background Texture: As selected by Architect from manufacturer's full range.
7. Integrally Cast Border Style: As indicated, if not indicated Double-raised line border.
8. Mounting: Concealed studs.

2.2 MATERIALS

A. Brass Castings: ASTM B 584, alloy recommended by manufacturer and finisher for finish indicated.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:

1. Plaque Mounting Fasteners:
   a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated.

2.4 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
2. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

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

3.2 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.
2. Illuminated, fabricated channel dimensional characters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size .
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article .

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A.R.K. Ramos.
   b. ASI Sign Systems, Inc.
   c. Gemini Incorporated.
   d. Metallic Arts.
   e. Southwell Company (The).
2. Character Material: Sheet or plate aluminum.
3. Character Height: As indicated on Drawings.
4. Thickness: 0.25 inch.
5. Finishes:
   a. Baked Enamel or Powder Coat Finish: Manufacturer’s standard in color as selected by Architect from manufacture’s full range of colors.
   b. Overcoat: Manufacturer's standard baked-on clear coating .
6. Mounting: Projecting studs.
   a. Cutout Character Sign Schedule:
      1) Sign Type - Cutout Characters.
         a) Character Size: 6 inch.

b) Text/Message: 1234 (ADDRESS)
c) Quantity: 1 Set
d) Location: Exterior, as indicated or as directed by Architect.

B. Fabricated Channel Characters : Metal face and side returns , formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A.R.K. Ramos.
   b. ASI Sign Systems, Inc.
   c. Gemini Incorporated.
   d. Metallic Arts.
2. Illuminated Characters: Backlighted character construction with LED lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
   a. Power: As indicated on electrical Drawings .
3. Character Material: Sheet or plate aluminum.
4. Finishes:
   a. Baked Enamel or Powder Coat Finish: Manufacturer’s standard in color as selected by Architect from manufacturer’s full range of colors.
   b. Overcoat: Manufacturer's standard baked-on clear coating .
5. Mounting: Projecting studs.
   a. Hold characters at 2-inch distance from wall surface.
   b. Dimensional Character Sign Schedule:
      1) Sign Type 1 –Illuminated Backlighted Channel Characters
         a) Size: 8 inch high.
         b) Logo: “PUBLIC SAFETY CENTER”, as indicated on drawings.
         c) Quantity: 1 Set
         d) Location: As indicated or as directed by Architect.
      2) Sign Type 2 –Illuminated Backlighted Channel Characters
         a) Size: 72 inch high.
         b) Logo: “City of Port Aransas Logo”, as indicated on drawings.
         c) Quantity: 1 Set
         d) Location: As indicated or as directed by Architect.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
3. Sign Mounting Fasteners:
   a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
   b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
   c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

SECTION 10 14 23 - PANEL SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Panel Signage Systems:

1. Room and Building Identification Signage – One sign to be provided at each door (Interior & Exterior) in the Door Schedules provided in the drawings.
2. Changeable Message Insert Panels. (Typical at all offices)

1.2 REFERENCES

A. Americans with Disabilities Act (ADA).

B. American National Standards Institute (ANSI):

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities Standards.

1.3 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.

PART 2 PRODUCTS

2.1 INTERIOR SIGNAGE SYSTEM: Room and Building Identification.

A. AlumaSet© (ALS) Series Signage: ADA compliant room identification signage system.

1. Model No.:
   a. ALS-CA-GP2-GP6-LAM-05.5-07.5
   b. ALS-CM-GP2-GP6-LAM-PP-05.5-07.5
   c. ALS-WF-GP2-GP6-LAM-PP-05.5-07.5
   d. ALS-RR-GP2-LAM-09-06
2. Description: ADA compliant sign with extruded aluminum frame. ADA text, pictograms welded to acrylic core using VisiTouch®; DuraDot© Braille rasters as specified; Changeable message (CM) inserts as specified;
   a.. Size: 8”x8”
3. Extruded Aluminum Frame: Single Piece Extrusion
   a. Finish: Clear Satin Anodized
   b. Finish: Painted
4. Room Number Panel: Color Laminate on acrylic substrate.
5. Room Name Panel for Changeable Message: 3/16” Clear Non-Glare Acrylic lens for message insert.
6. Room Name Panel for Room Identification and Restroom Signs: Color Laminate on Acrylic substrate.
7. Message Inserts: Removable for copy changes, with set screw. Made of printed background and text on paper insert.
   a.. Painted/ digitally printed Pattern/Colors: As selected by Architect.
   b.. Text: As selected by Architect.

B. Lettering, Numbering and Symbols

1. Braille: Tactile Grade 2 DuraDot© Braille integral with sign face, raised 1/32 inch (0.8 mm).
   a. Rasters: Acrylic rasters with .059 inch (1.5 mm) surface diameter, body of sphere pressure secured below face laminate. Glued-on dots are not acceptable.
2. VisiTouch® Raised Symbols: 3 inches (76 mm) min. high, raised 1/32 inch (0.8 mm) from sign face, unitized with acrylic sign core.
4. VisiTouch® Raised Lettering: 5/8 inch (16 mm) high minimum, raised 1/32 inch (0.8 mm) from sign face, unitized with acrylic sign core.
   a. Color: As selected by Architect.
   b. Lettering Style: Helvetica 721.
5. VisiTouch® Raised Room Number: 5/8 inch (16 mm) high minimum, raised 1/32 inch (0.8 mm) from sign face, unitized with acrylic sign core
   a. Color: As selected by Architect.
   b. Lettering Style: Helvetica 721.
6. Copy: All Lettering, numbering and symbols contrast with background, eggshell matte finish.

C. Changeable Message Insert Panels:
1. Clear non-glare acrylic lens or window for message insert
a.. Text: As selected by Architect.
b.. Lettering Style: As selected by Architect.
2. Paper Insert:
a.. Text: As selected by Architect.
b.. Lettering Style: As selected by Architect or
3. Message Insert to be provided by Owner

2.1 GRAPHIC APPLICATION METHODS
A. PS-1 - Engraved.
B. PS-2 - VisiTouch® with DuraDot© Braille: ADA compliant.
1. Description: Dimensional letters precision cut from plastic and chemically welded through the face laminate to the acrylic core, producing an integral raised letter, 1/32 inch (0.8 mm). Colors to be selected from standard color chart.
C. PS-6 - Digital Print
1. Description: Printing from a digital based image directly to paper or vinyl

PART 3 EXECUTION

3.1 EXAMINATION
A. Installer shall examine signs for defects, damage, and compliance with specifications.
B. Inspect conditions of substrate and other conditions which may affect installation of signage.
C. Installation shall not proceed until satisfactory conditions are achieved.
D. Do not begin installation until substrates are within manufacturer's specified tolerances and have been prepared in accordance with manufacturer's instructions.
E. If substrate preparation is the responsibility of another installer, do not proceed with installation. Notify Architect of any unsatisfactory conditions immediately.
F. Commencement of work is deemed as acceptance of installation conditions.

3.2 PREPARATION
A. Verify mounting heights and locations for signage will comply with specified requirements, including accessibility requirements.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Clean mounting locations of dirt, dust, grease or similar conditions that would prevent proper installation.

3.3 INSTALLATION
A. Install in accordance with manufacturer's printed installation instructions, and in proper relationship with adjacent work.
B. Use mounting methods and fasteners as recommended by the manufacturer.
C. Install interior room identification signage by means of double sided tape and silicone, installed so that the base line of the highest line of raised text is no more than 60 inches (1524 mm) above finished floor and the baseline of the lowest line of raised text is no less than 48 inches above finish floor adjacent to the latch side of the door in accordance with ADA SAD 2010 requirements, unless otherwise noted. Where there is no wall space, including double leaf doors, sign shall be placed on the nearest adjacent wall.
D. Set level, plumb, rigid and at heights indicated with surfaces free from defects.

3.4 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 14 23

SECTION 10 28 00 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Under lavatory guards.
4. Custodial accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 WASHROOM AND SHOWER ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.

B. Toilet Tissue (Roll) Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 2888.
   2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
   3. Mounting: Surface mounted.
   4. Capacity: Designed for two standard diameter tissue rolls.
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Towel (Roll) Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 2860
   2. Description: Unit for dispensing preset length of roll paper towels.
   3. Mounting: Surface.
   4. Minimum Towel-Dispenser Capacity: 8-inch- (203-mm-) wide, 8 inch diameter- (203-mm-) roll.
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
   6. Lockset: Tumbler type for towel dispenser compartment.

D. Liquid-Soap Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 40.
   2. Description: Designed for dispensing soap in liquid or lotion form.
   3. Mounting: Vertically oriented, surface mounted.
   4. Capacity: 40 fl. oz..
   5. Materials: ABS Plastic.

E. Sanitary Napkin Disposal:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 35139.
   2. Description: Designed for dispensing soap in liquid or lotion form.
   3. Mounting: Vertically oriented, surface mounted.
   4. Capacity: 0.6-gal. (2.3-L).
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

F. Grab Bar:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 5806.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: 304 Stainless steel, 18 gauge (1.2 mm) thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/4 inches (32 mm).
   5. Configuration and Length: As indicated on Drawing.

G. Mirror Unit
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 1656 1840.
   2. Frame: Stainless-steel channel.
      a. Corners: One piece frame channel frame (½" x ½" x ½") with mitered corners.
   3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
      a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
   4. Size: 18" x 40".

H. Shower Curtain Rod:
   1. Basis-of-Design Bobrick Washroom Equipment, Inc; B-6047.
   2. Description: 1-1/4-inch outside diameter, straight rod.
   3. Configuration: As indicated on Drawings

4. Mounting Flanges: Exposed fasteners; in manufacturer's standard material and finish.
5. Rod Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

I. Shower Curtain:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; 204-3.
2. Size: Minimum 6 inches wider than opening by 72 inches high.
3. Material: Vinyl, minimum 0.008 inch thick, opaque, matte, with integral antibacterial and flame-retardant agents.
4. Color: White.
5. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
6. Shower Curtain Hooks: Stainless steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

J. Folding Shower Seat:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B-5181.
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Dimensions: 33 inches wide by 20 inches deep.

K. Towel Bar:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B-545.
2. Description: 15/32-inch- round tube with 3/4 inch circular end posts.
3. Mounting: Flanges with concealed fasteners.
4. Length: 24 inches.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

L. Robe Hook:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B-542.
2. Description: Single-prong unit.
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Under lavatory Guard:
1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

B. Custodial Utility Shelf:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B-298.
2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
3. Size: 24 inches long by 8 inches deep.
4. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Mop and Broom Holder:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 223.
2. Description: Surface mounted mop/broom holder
3. Length: 36 inches (914 mm).
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

D. Towel (Roll) Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc; B 2860
   2. Description: Unit for dispensing preset length of roll paper towels.
   3. Mounting: Surface.
   4. Minimum Towel-Dispenser Capacity: 8-inch- (203-mm-) wide, 8 inch diameter- (203-mm-) roll.
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
   6. Lockset: Tumbler type for towel dispenser compartment.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 10 41 16 – EMERGENCY KEY CAGINET (KNOX BOX)

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. Rapid Entry System (Fireman's Lock Box)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product specified within this specification.

1. Manufacturer's Specifications
2. Manufacturer's Installation Instructions

B. Shop Drawings: Show sizes, locations and installation details. Include utility (electrical, water, gas) requirements.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product specified within this specification.

1.5 COORDINATION

A. Coordinate Work of this Section with work of other sections in which items are to be installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 APPROVED MANUFACTURERS

A. Specifications are based on named products and manufacturers. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Division 1requirements regarding substitutions to be considered.

2.3 RAPID ENTRY SYSTEM (FIREMAN'S LOCK BOX): FLB

A. Fire Department Lock Box (main entry): Knox Company No. 4400 recessed single lock, with recessed mounting kit.

B. Provide alarm tamper switches (UL Listed) for connection to building's security system.

C. Color selected by Architect from manufacturer's available colors.

D. Location: Location to be determined by Fire Authority having jurisdiction and as directed by Architect.

2.4 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify utility (electrical, water, and gas) requirements, where applicable, are installed and ready for connection.

B. Examine walls and partitions for suitable framing depth and blocking where items are indicated to be installed.

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

3.2 INSTALLATION

A. General: Install items in locations and at mounting heights indicated or if not indicated then as directed by Architect.

B. Install all items in accordance with manufacturer's printed instructions in locations shown on drawings.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as items are installed unless otherwise indicated in manufacturers written installation instructions.

B. Adjust items to operate properly.

C. On completion of installation of item, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace items that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by manufacturers.

E. Replace items that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104116

SECTION 10 44 16 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

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 this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Mounting brackets.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for verification purposes of each type of metal finish required, prepared on metal samples of same thickness and alloy indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

1.4 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Walter Kidde, Division of Kidde, Inc.
4. American Specialties Inc.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.

1. Fill and service extinguishers to comply with requirements of governing authorities and manufacturer.
2. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb. nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

A. Provide brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated in plated finish.

1. Provide brackets for extinguishers not located in cabinets.

2.4 FIRE EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

1. Semirecessed: Cabinet box (tub) partially recessed in walls of shallow depth.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
   1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      a. Rolled-Edge Trim with 2-1/2-inch backbend depth.
      b. Trim Metal: Of same metal and finish as door.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
   1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.

F. Door Style: Manufacturer's standard design.
   1. Full Glass Panel: Float glass, 1/8-inch thick.

G. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.5 FINISHES FOR FIRE EXTINGUISHER CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

2.6 STEEL FIRE EXTINGUISHER CABINET FINISHES

A. Surface Preparation: Solvent-clean surfaces in compliance with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel in compliance with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard 2-coat baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 2.0 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss.
      a. Exterior of cabinet except for those surfaces indicated to receive another finish.
      b. Interior of cabinet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
   1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
   2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
   3. Where exact location of surface-mounted cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

B. Identify existence of fire extinguisher in cabinet with lettering spelling "fire extinguisher" applied to door by process indicated below. Provide lettering to comply with requirements indicated for letter style, color, size, spacing and location or, if not manufacturer's standard arrangements.
   1. Application Process: Silkscreen.

END OF SECTION 10 44 16

SECTION 10 75 00 - FLAGPOLES

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 ground-set flagpoles made from aluminum.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete footings for flagpoles.
2. Division 7 Section "Joint Sealants" for elastomeric sealant filling the top of the foundation tube.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."

1. Base flagpole design on nylon flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
2. Basic Wind Speed: Comply with .applicable code requirements.

1.4 SUBMITTALS

A. Product Data: For each type of flagpole required.

B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems.

1. Include details of foundation system for ground-set flagpoles.

C. Structural Calculations: For flagpoles indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Finish Samples for Verification: For each finished material used for flagpoles and accessories.

E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1. Obtain flagpoles through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

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. American Flagpole; a Kearney-National Inc. Company.
2. Concord Industries, Inc.
3. Ewing International.
4. PoleTech

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. For stepped-sectional flagpoles, provide self-aligning, snug-fitting joints.

B. Exposed Height:

1. One at 35 feet

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/ (B 241M), Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm). Heat treat after fabrication to comply with ASTM B 597, Temper T6.

D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch- (1.6-mm-) minimum nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.
2. Provide steel ground protectors extending 12 inches (300 mm) aboveground and 6 inches (150 mm) belowground for steel flagpoles where flashing collars are not provided.

E. Sleeve for Aluminum Flagpole: PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Provide flashing collar of same material and finish as flagpole.

F. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

1. Provide units made from same metal and with same finish as flagpoles.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, to match flagpole-butt diameter.

1. 0.063-inch (1.6-mm) spun aluminum with gold anodic finish**.**

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

C. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

1. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa, unless otherwise indicated.)

B. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107.

C. Sand: ASTM C 33, fine aggregate.

D. Elastomeric Joint Sealant: Joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (non-traffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611..

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Install flagpoles in accordance with generally prescribed guidelines for display of the American flag.

C. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107500

SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal louver blinds with polymer slats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Levolor Inc.; Faux Wood Blinds or comparable product by one of the following:

1. Hunter Douglas Architectural Window Coverings.

B. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.

1. Width: 2 inches.

2. Thickness: 0.105 inch.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully encloses operating mechanisms on three sides and ends.

1. Manual Lift Mechanism:

a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating range .

b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.

2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.

a. Tilt: Full.

b. Operator: Color coordinated wand.

3. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard .

4. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.

E. Bottom Rail: Secures and protects ends of ladders and lift cords.

1. Type: Manufacturer's standard.

F. Ladders: Braided cord.

G. Valance: Manufacturer's standard.

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

I. Colors, Textures, Patterns, and Gloss:

1. Slats: Match Architect's samples As selected by Architect from manufacturer's full range.

2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

B. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

C. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION 122113

SECTION 13 31 33 - FRAMED FABRIC STRUCTURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions Specification Sections, apply to this section.

1.2 SUMMARY

A. Hip Framed Shade Structure

1. 3 SUBMITTALS

A. Provide sealed structural engineering drawings and calculations.

B. Provide fabric samples and powder coat colors for final order selection.

1.4 QUALITY ASSURANCE

Fabrication and erection are limited to firms with proven experience in design and construction of fabric shade structures; such firms shall meet the following minimum requirements:

A. A single manufacturer must design engineer, manufacture the steel and fabric and erect the fabric shade structures including foundations.

B. All manufacturers must have at least ten (10) years of experience in the design, engineering, manufacture, and installation of structures with similar.

C. The manufacturers shall demonstrate that it has a staff of experienced fabric structure installation personnel who will undertake the installation of each project.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for shade structures shown on the Drawings in relation to the property survey and existing structures, and verify locations by field measurements prior to construction.

1.6 WARRANTY

1. Manufacturer’s warranty shall be provided for a period of 10 years on fabric and 10 years on the structural integrity of the steel from date of substantial completion.

PART 2 PRODUCTS

2.1 GENERAL

A. Basis-of-Design Product: Subject to compliance with requirements, provide Superior Recreational Products, Model Square Hip End Shade or a comparable product.
   1. Size: 38 feet X 38 feet.
   2. Height: 14 feet.
   3. Shape: Square

B. The structures shall include engineering drawings and calculations, patterning and fabrication of architectural membrane, structural steel frame, architectural hdpe membrane roof, steel cables, all fasteners, and installation of structure(s) including foundations.

C. The shade structure shall conform to the current adopted version of the International Building Code 2015 including local agency amendments and additions to the code.

D. All shade structures shall be engineered and designed to meet a minimum
   - 110 mph wind load
   - Exposure C
   - All shade structures shall be engineered with a zero wind pass through on the fabric.
   - 5 psf live load

E. Welding:
   1. All shop welded connections of the shade structure shall be designed and performed in strict accordance with the requirements of the “American Welding Society” (AWS) Specifications. Structural welds shall be made in compliance with the requirements of the “Prequalified” welded joints where applicable and by certified welders. No onsite or field welding shall be permitted.

F. Tension Cable: Steel cable is determined based on calculated engineering load.

G. Fabric Roof Systems:
   1. UV Shade Fabric:

a. UV Shade fabric is made of a UV stabilized high-density polyethylene. Mesh shall be Rachel knitted with monofilament and tape yarn filler to ensure that material will not unravel if cut. Panels to be 10ft wide.
b. Fabric shall meet the following fire resistance tests:
1) ASTM E84
2) NFPA 701-97 (Weathered of un-weathered)

2. Size/Form: See site plan and construction details for size requirements for each structure. See site plan for layout.
3. Stitching & Thread:
a. All sewing threads are to be double stitched.
b. Thread shall be GORE Tenara Sewing Thread manufactured from 100% expanded PTFE; mildew resistant exterior approved thread. Thread shall meet or exceed the following:
1) Flexible temperature range
2) Very low shrinkage factor
3) Extremely high strength, durable in outdoor climates
4) Resists flex and abrasion of fabric
5) Unaffected by cleaning agents; acid rain, mildew, salt water and rot resistant, unaffected by most industrial pollutants
6) Treated for prolonged exposure to the sun
4. Fabric colors shall be determined from the standard colors available from the manufacturer by the Architect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framed fabric shade structure in accordance with manufacture’s written instructions.

B. Foundations:

1. Footings shall be placed in accordance with and conform to manufacturers engineered drawings.

END OF SECTION 13 31 33

SECTION 211313 - SPRINKLER SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

B. Wet-pipe sprinkler system.

C. Dry-pipe sprinkler system

D. Dry-agent fire suppression system.

E. System design, installation, and certification.

F. Fire department connections.

1.2 SYSTEM DESCRIPTION

A. System to provide wet pipe coverage for entire building.

B. Provide dry pipe systems for areas subject to freezing conditions.

C. Provide a dry agent fire suppression system to serve the Dispatch and related areas as noted on the drawings System shall be equal to “3M Novec 1230”.

D. Determine volume and pressure of incoming water supply from water flow test data.

E. Interface system with building fire detection and alarm system.

F. Provide fire department connections as indicated.

1.3 SUBMITTALS

A. Submit under provisions of Section 220500.

B. Shop Drawings: Indicated hydraulic calculations, detailed pipe layout, hangers and supports thrust blocks, components and accessories. Indicate system controls.

C. Product Data: provide data on sprinkler heads, valves, and specialties, including manufacturers catalog information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.

D. Submit shop drawings, product data and hydraulic calculations to authority having jurisdiction for approval prior to submission to the Architect/Engineer. Submit proof of approval to Architect/Engineer.

E. System Certification: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 220500.

B. Record actual locations of sprinkler heads and deviations of piping from drawings. Indicate drain and test locations.

1.5 OPERATIONS AND MAINTENANCE DATA

A. Prepare and submit to the Architect for delivery to the Owner two sets of an indexed manual with complete technical data for every piece of equipment and material installed under this Contract.
   1. Complete plumbing submittals that were approved for the project.
   2. Manufacturer's installation instruction brochures.
   3. Manufacturer's local representative and/or distributor's name and address.
   4. Manufacturer's operating and maintenance brochures.
   5. Manufacturer's internal wiring diagrams.
   6. Replacement part number listings and/or descriptions including prices and source of supply.
   7. Lubrication materials required, with instructions.
   8. Valve tag list and schematic diagram.
   9. All warranties and guarantees.

B. These manuals shall include all of the listed data bound into a permanent hard-back binder identified on the cover as "Operating and Maintenance Manual". Provide a title page listing the name and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Trade-Contractors installing equipment represented in the brochure.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 13 and the requirements of the local authority having jurisdiction. In cases where the specifications are more stringent than NFPA 13, comply with the specifications.

B. Standpipe and Hose Systems: Perform work in accordance with NFPA 14.

C. Fire Service Building Entrance: Perform work in accordance with NFPA 24.

D. Welding Materials and Procedures: Perform to A.W.S. standards.

E. Equipment and Components: Bear UL and FM label or marking.

F. All electrical work shall comply with Division 26.

G. All pipe and fittings shall be manufactured in the U.S.A.

1.7 QUALIFICATIONS

A. Installer: Company specializing in performing work of the section with minimum three years experience.

B. Design sprinkler system under direct supervision of a professional Engineer or Responsible Managing Employee (RME) experienced in design of this work and licensed at place where the project is located in the State of Texas.

1.8 REGULATORY REQUIREMENTS

A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of authority having jurisdiction.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products under provisions of Section 220500.

B. Store products in shipping containers and maintain in place until installation.

1.10 EXTRA MATERIALS

A. Provide extra sprinkler heads under provisions of NFPA 13.

B. Provide suitable wrenches for each head type.

C. Provide metal storage cabinet in location designated.

PART 2– PRODUCTS

2.1 BURIED BUILDING ENTRY PIPING

A. Ductile Iron Pipe (ASTM A377):
   1. Fittings: ANSI/AWWA C110 ductile iron with mechanical joint connections.

B. 6” and Larger: In-Building Riser; 304 stainless steel, one-piece 90 degree fitting, 175 PSI working pressure, grooved-end outlet, CIPS inlet end. Ames, Wilkins.

C. Remote F.D.C. Piping: In-Building Riser; 304 stainless steel, one-piece 90 degree fitting, 175 PSI working pressure, grooved-end outlet, CIPS inlet end. Ames, Wilkins.

2.2 ABOVE GROUND PIPING

A. Steel Pipe, 1-1/2” and Smaller: ANSI/ASTM A53, standard weight.

B. Steel Pipe, 2” and Larger: ASTM A795, Type E, Grade A; black lightweight, Schedule 10.
   1. Welding Fittings: ANSI/ASTM A234 seamless black steel; standard weight.
   2. Threaded Fittings: ANSI/ASTM B16.3, black; class 150 malleable iron.
   3. Flanges: ANSI B16.5, class 150 black steel with 1/16-inch raised face.
   4. Companion Flanges: ANSI B16.1, class 150 black cast iron, flat faced, threaded.
   5. Grooved Fittings: ASTM A47 malleable iron, black, enamel coated.
   6. Grooved Couplings: ASTM A47 malleable iron black, enamel coated split coupling with EPDM gasket.

C. Support in accordance with NFPA 13 whichever is most stringent.
   1. Provide electrogalvanized hanger rods with galvanized nuts and washers, beam clamps, and split ring or clevis hangers.

2.3 VALVES

A. Provide threaded end, grooved end or flanged valves. Valves shall be U.L. or F.M. listed

B. Drain Valves: bronze ball valves with 3/4-inch hose thread and cap and chain.

2.4 SPRINKLER HEADS

A. Suspended Ceiling:
   1. Type: Concealed pendant type with matching escutcheon plate.
   2. Head Finish: Brass.
   3. Escutcheon Plate Finish: White.

4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type:
   1. Type: Standard upright type with guard.
   2. Head Finish: Brass.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Sidewall Type:
   1. Type: Standard horizontal sidewall type with matching escutcheon plate.
   2. Head Finish: Chrome plated.
   3. Escutcheon Plate Finish: Chrome plated.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Institutional / Detention Type:
   1. Tyco Raven 5.6 institutional pendent and sidewall, quick response, standard and extended coverage.

E. Guards: Finish to match sprinkler head.

2.5 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically or hydraulically operated alarms, with accelerator.

C. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum red enameled gong and motor housing, nylon bearings, and inlet strainer.

D. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

E. Tamper Switch: Valve supervisory switch with two sets of contacts rated 15 amps at 115 volts AC with die cast aluminum cover in red enamel finish.

F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts rated 10 amp at 115 volt AC.

G. Pressure Switch: Air pressure supervisory capable of detecting 10 psi high/low pressure differential from normal system pressure, with two contacts rated at 10 amps at 115 volt AC.

H. Fire Department Connection:
   1. Type: Flush mounted wall type with chrome plated finish.
   2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching materials and finish.
   3. Drain: 3/4 inch automatic drip, outside.
   4. Label: “Sprinkler – Fire Department Connection”.

I. Flexible Stainless Steel Sprinkler Drops: Flexible braided stainless steel hose with ceiling bracket, UL and FM approved. Flexhead Industries, VicFlex.

2.6 MAINTENANCE AIR COMPRESSOR

A. Single stage, direct dive, electric motor driven, air cooled, oil-less compressor with air pressure operated electric switch, motor, safety valves, check valve and controls suitable for mounting on the Fire Main.

B. Performance: 2.0 scfm at 50 psi continuous operating pressure. Safety relief valve set at 65 psig.

C. Motor 0.25 HP, 7.4 amp, 115 volt, single phase, 60 Hz.

PART 3– EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe before welding.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Coordinate work of this section with other affected work.

3.2 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Provide valve supervisory switches at all valves.

C. Provide water flow switches in the main riser and in branch line from a riser on each floor.

D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

E. Locate outside alarm gong on building wall as indicated.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Install heads in the center of the ceiling tile.

I. Apply masking tape or paper cover to ensure concealed sprinkler head cover plate do not receive field paint finish.

J. Provide guards in exposed areas where heads are subject to damage.

K. Flush entire piping system of foreign matter.

L. Hydrostatically test entire system.

M. Install piping in accordance with NFPA 13 for sprinkler system, NFPA 14 for standpipe and hose systems, NFPA 24 for service mains and provisions of these specifications whichever is more stringent.

N. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

O. Install piping to conserve building space, and not interfere with use of space and other work.

P. Group piping whenever practical at common elevations.

Q. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

R. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

S. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

T. Do not penetrate building structural members unless indicated.

U. Provide sleeves. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

V. Die cut screw joints with full cut standard taper pipe threads with non-toxic joint compound applied to male threads only.

W. Install valves with stems upright or horizontal, not inverted. Remove protective coating after installation.

X. Provide drain valves at main shut-off valves and low points of piping and apparatus.

Y. Provide reaction blocking or anchorage at all dead ends, tees, crosses and bends in underground piping. Locate behind the fitting and symmetrical with the axis of the resultant thrust. Minimum 1500 psi; concrete. Place blocking so that joints remain accessible. Provide restraining rods and anchors as required by NFPA 24.

Z. The Contractor shall provide the piping and make the final connection to the utility stub-outs.

AA. If electric bells are provided in lieu of the water motor type, the Contractor shall provide the required electric power connection for the bell.

3.3 TESTS

A. Upon completion and prior to acceptance of the installation, the Contractor shall subject the system to the tests required by NFPA 13 and the requirements of the local authority having jurisdiction.

END OF SECTION

SECTION 220500 - BASIC PLUMBING REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. The requirements set out in Bidders Documents, Contract Forms, General Conditions, Supplementary General Conditions and Special Conditions apply to all work specified in the sections of this Division.

B. While these specifications may be arranged in sections which describe work associated with particular trades or sub-contracts, such sections are not intended to describe all the work of any particular trade or sub-contract. Work required of a particular trade or sub-contract may also appear in other sections of the Specifications, and any given section may describe work of several different trades or sub-contracts. The particular sub-division of work between the Contractor and his sub-contractors shall be resolved by those parties, and not necessarily limited nor defined by any particular section of the Specification. The Contractor for the project shall be responsible for all work, regardless of which trade or sub-contract may actually perform the work. The reference to “Contractor”, as used herein, refers to the single, prime, Contractor for the total project, who will enter into an Agreement with the Owner for the total performance of the work.

C. Work covered by the Plumbing Sections of these Specifications shall include the furnishings of all materials, labor, taxes, transportation, safe working conditions, tools, permits, fees, inspections, utilities and incidentals necessary for the complete and operable installation of all plumbing systems.

D. Under these Contract Documents, the Contractor shall provide an installation that is complete in every respect. It shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

E. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, and all details of the work and the working conditions and to verify all dimensions and elevations in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor’s site visit, the verification and coordination of all existing conditions, and the inclusion of all considerations related to the existing conditions.

F. The responsibility for the furnishing of the proper equipment and/or material and the responsibility for seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor. The Contractor shall consult and request advice and supervisory assistance from the representative of the specific manufacturer for proper installation, operation, and startup. The manufacturers’ published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment. The contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract documents and the manufacturers’ directions and shall obtain the Architect’s instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer’s directions or such instructions from the Architect, he shall bear all resulting costs that may arise from any system or equipment deficiencies.

1.2 DRAWINGS AND SPECIFICATIONS

A. These Specifications are accompanied by Drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, light fixtures, etc. Items specifically mentioned in the Specifications but not shown on the Drawings and items shown on the Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were indicated by both.

B. If departures from the Drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance of the Architect.

C. The interrelation of the Specifications, the Drawings, and the schedules is generally as follows: The Specifications determine the nature and setting of the several materials, the Drawings establish the quantities, dimensions, and details, and the schedules give the performance characteristics.

D. Should the Drawings disagree in themselves or with the Specifications or with the various codes and regulations, the better quality or greater quantity of work or materials shall be assumed and estimated, and unless otherwise directed by the Architect in writing, shall be performed or furnished. In case the Specifications should not fully agree with the schedules, the latter shall govern. Figures indicated on Drawings govern scale measurements and larger scale details govern small scale Drawings.

1.3 SUBMITTALS

A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of Work. Three weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data. After the Contract is awarded, the Contractor will advise the Engineer in writing of the schedule for submission of shop drawings and product data and the persons authorized to sign submittal data on behalf of the Company.

B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

C. Before submission of Shop Drawings and Brochures, the Contractor shall certify that each Shop Drawings and each item of material or equipment complies with the Contract Documents for this Project. Such certification shall be made by the Owner, a Partner, a Corporate Officer of the Contractor, or by a person duly authorized to sign for the Contractor. Unless so certified, Shop Drawings and/or Brochures will be returned for resubmittal. Certifications shall be in the form of rubber stamp impressions or typed letter which states:

> I hereby certify that this Shop Drawing and/or brochure and the equipment and material shown on this Shop Drawing and/or Brochure complies in all respects (except as noted*) with the requirements of the Contract Documents for this

Project. I further certify that all data shown herein as to performance, dimensions, construction, materials, and other pertinent items are true and correct.

___(Name Of Contractor)_____

Signed _____

Position _____

Date _____

* Refer to exception requirements herein.

D. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: Title of the Sheet or Brochure; name and location of the building; names of the Architect, Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:
   1. Shop Drawings: Drawings shall be newly prepared and not reproduced from the Contract documents, drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by a draftsman skilled in this type of work. All plumbing, equipment layouts and similar Shop Drawings shall be drawn to at least 1/4" = 1'-0" scale.
   2. All Shop Drawings shall indicate the equipment actually purchased and the exact routing for all lines. The elevation, location, support point, load imposed on the structure at support and anchor points, and size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All Design Drawing space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, etc., unless proper written authorization is received from the Architect to change them. All associated equipment, ductwork, piping, and conduit shall be coordinated and clearly shown on the Shop Drawings.
   3. Brochures: Brochures submitted to the Engineer shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space.
   4. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.

E. The submittal format shall follow the Specifications format with a submittal required for each section of Division 22.

F. Submittal data for each section must be complete. Partial submittals will not be reviewed. To the greatest extent possible all sections shall be submitted with the first submission. No more than three additional submissions will be allowed to complete the submittal package.

G. Unless a greater number is indicated within Division One of these specifications, submit six (6) copies of all Brochures for review. Submit shop drawings for review.

H. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Architect reserves the right to require the Contractor to furnish items exactly as described in the Contract Documents.

I. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they do not meet the specifications. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contactor is not able to furnish an acceptable alternate until the proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Architect and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Owner based on the particular circumstances.

1.4 DIGITAL (AUTOCAD) DRAWING FILES

A. If desired by the Contractor, a sub-contractor or product supplier for use in preparing shop drawings, installation drawings, as-built drawings or other project related documentation, AutoCAD drawing files may be obtained from MS2 Inc..

1.5 RECORD DRAWINGS

A. The Contractor shall keep a set of Drawings on the job, noting daily all changes made in these Drawings in connection with the final installation, including exact dimensioned locations of all new and uncovered existing active and inactive utilities outside the building, and shall turn over a clean, neatly marked set of Drawings showing “as-installed” work to the Architect/Engineer for delivery to the Owner. All underground utilities, services, and systems shall be accurately located by the Contractor and dimensioned on the “as-installed” Drawings.

1.6 SPACE LIMITATIONS

A. Equipment has been chosen which will fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the Code requirements and the requirements of the local inspection department.

B. In the preparation of Drawings, a reasonable effort to accommodate approved Equipment Manufacturers’ space requirements has been made. However, since space requirements and equipment arrangement vary according to each Manufacturer, the responsibility for initial access and proper fit rest with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to Architect’s review:

1.7 OPERATING AND MAINTENANCE MANUAL

A. Prepare and submit to the Architect for delivery to the Owner two sets of an indexed manual with complete technical data for every piece of equipment and material installed under this Contract.
   1. Complete plumbing submittals that were approved for the project.
   2. Manufacturer’s installation instruction brochures.
   3. Manufacturer’s local representative and/or distributor’s name and address.
   4. Manufacturer’s operating and maintenance brochures.
   5. Manufacturer’s internal wiring diagrams.
   6. Replacement part number listings and/or descriptions including prices and source of supply.
   7. Lubrication materials required, with instructions.

8. Valve tag list and schematic diagram.
9. All warranties and guarantees.

B. These manuals shall include all of the listed data bound into a permanent hard-back binder identified on the cover as “Operating and Maintenance Manual”. Provide a title page listing the name and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Trade-Contractors installing equipment represented in the brochure.

C. Contents of the manual shall be grouped in sections according to the various sections of Division and shall be listed in a Table of Contents.

1.8 QUALITY ASSURANCE

A. The Contractor shall comply with all applicable city, county, state, or federal rules, codes and ordinances.

B. None of the terms or provisions of this Specification shall be construed as waiving any rules, regulations, or requirements of these authorities.

C. A competent foreman or superintendent, initially approved by the Architect, shall be kept by the Contractor at the building to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Architect. Architect’s and/or Owner’s representatives shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the Architect’s representative. Recommendations made shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced at once, to the satisfaction of the Architect.

D. It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

E. The Plumbing Drawings are diagrammatic in character and cannot show every connection in detail or every pipe and duct in its exact location. These details are subject to the requirements of codes, ordinances and also electrical, structural and architectural conditions. The Contractor shall carefully investigate all electrical, structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases or above suspended ceilings, etc., in finished portions of the building, unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers hall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise note.

F. The approximate location of each item is indicated on the Drawings. These Drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the approval of the Architect. The Architect and Engineer reserves the right to make reasonable changes in the locations indicated without additional cost.

1.9 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided protect equipment from rust, weather, humidity, dust, or physical damage.

1.10 UTILITIES

A. The Contract Documents reflect the general location, size, and elevations of sewer lines; location, size and pressure of water and other lines; and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local utility companies in order to coordinate and confirm the exact requirements for each utility to provide a complete and operative system. The bid submitted by the Contractor shall include costs for all such coordinative work, as well as any and all utility company charges and/or fees.

1.11 TEMPORARY SERVICES

A. It shall be the responsibility of the Contractor to provide a temporary system for each utility that is required during construction with all such temporary utility costs being billed to the Contractor.

1.12 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of twelve (12) months after the final acceptance of work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The specifications contain the names of manufacturers which are considered acceptable based on the quality of the product.

B. Where acceptable manufacturers are listed, only products of those manufacturers may be provided. Additionally, the product must meet all the detailed requirements of the specifications.

C. If no manufacturer's name is mentioned, the Contractor shall provide equipment and material which meet the specifications.

D. The drawings represent the manufacturer's equipment scheduled. The listing of acceptable manufacturers in the specifications is not intended to imply that equipment of these other manufacturers will fit in the space provided or have the same electrical, structural or other requirements as the equipment scheduled. The Contractor must insure that the equipment provided will meet all project requirements prior to submitting data on the equipment.

2.2 MATERIALS AND EQUIPMENT

A. All materials shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been treated in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

B. Materials and equipment shall be new and shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these Specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years prior to bid opening. Where custom or special items are required, these shall be fully described using Drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

C. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

D. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions. Where approved equipment requires electrical power other than those used for design purposes, the Contractor shall be responsible to adjust protective devices, starter sizes, conductors, conduits, etc. to accommodate this approved device electrically.

E. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the items of equipment. All data on nameplates shall be legible at the time of final inspection.

F. Equipment vibration shall not exceed the following criteria:

Equipment	Maximum Allowable Vibration Peak to Peak Displacement (MIL)
Pumps	
1800 RPM	2
3600 RPM	1

G. All pipe, fittings, appurtenances, and other material required for complete installation of these systems shall be new to conform to manufacturer's recommendations, unless otherwise specified. All equipment damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of final completion, shall be replaced by this Contractor without extra cost to the Owner. Scratched equipment shall be repainted with factory paint to match existing or cold galvanized as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install unions or flanges at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of system. No union or flange will be required in welded lines or lines assembled with solder joint fittings, except at flanged valve or union connected equipment items, machinery items, and other special pieces of apparatus. Unions in 2 inches and smaller ferrous lines shall be 300 lbs. AAR, malleable iron unions with iron to brass seats, and 2-1/2 inches and larger shall be ground flange unions. Unions in copper lines shall be 125 lbs. ground joint brass union, or 150 lbs. brass flanges, if required by the matching item of equipment. Companion flanges on lines at various items of equipment, machines and pieces of apparatus, shall serve as unions to permit removal of the particular items. Unions or flanged devices connecting ferrous pipe to copper or brass pipe shall be dielectric type.

B. All equipment shall be installed in a manner to permit access to parts requiring service without disassembly of piping mains and other equipment. Access panels or doors shall be coordinated with the Architect and provided where necessary to permit valve equipment service or removal.

C. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly and completely protected against damage.

D. This Contract includes many different systems furnished and installed by different trades. Each trade shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping any other trades. Where space requirements conflict, the following order of precedence shall, in general be observed:
   1. Building lines.
   2. Structural members.
   3. Soil and drain piping.
   4. Vent piping.
   5. Refrigerant piping.
   6. Steam piping.
   7. Condensate piping.
   8. Electrical bus duct.
   9. Supply ductwork.
   10. Exhaust, return, and outside air ductwork.
   11. Fire sprinkler piping.
   12. Circulating water piping.
   13. Domestic hot and cold water piping.
   14. Natural gas piping.
   15. Electrical conduit.

3.2 HOUSEKEEPING PADS

A. Provide concrete housekeeping pads, pinned to floor or monolithic poured with structure, for water heaters, water softener, booster pump, and any other floor mounted equipment.. Construct pad of minimum 2000psi concrete, reinforced using #6 wire mesh. Pad height, minimum 3-1/2 inches above finished floor. Pad length and width of dimensions equal to or greater than the foot print of the supported equipment

3.3 EXCAVATION AND BACKFILL

A. The Contractor shall perform all excavation of every description required in the execution of his work. Excavation shall be through whatever substance encountered, to the depths indicated on the Drawings, or as required. Excavated material suitable for backfill shall be piled in an orderly manner a sufficient distance from the trench to prevent overloading sides and cave-ins. Excavated materials not suitable for backfill shall be removed from the site or stored as directed. Grading shall be done to protect the excavation from surface water. Trenches shall be maintained in a dry condition by bailing, pumping, or other approved methods. Pipe shall not be laid in wet trenches.

B. Sheeting and shoring shall be provided as required for the protection of the work and the safety of personnel. All excavations in excess of five (5) feet shall be in accordance with OSHA requirements relating to trench safety systems. Contractor shall certify that all trench safety systems will be in accordance with OSHA requirements. Certifications of trench safety systems shall be filed with the authority having jurisdiction.

C. Trenches shall be of the necessary width and depth to provide for proper laying of pipe and appurtenances, with banks as nearly vertical as possible. Bottoms of trenches shall be excavated to the grade and depth indicated or required, and barrel of pipe shall be laid on a minimum 12-inch sand bed. Bell holes, of a size to permit proper make-up of grading, shall be provided as required. Existing underground piping shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired to the Architect's satisfaction, at the Contractor's expense. Provide 3,000 pound concrete of 3 inches minimum enclosure around lines that cross electrical utility lines or telephone cables.

D. Trenches shall not be backfilled until all required test have been performed. This requirement does not preclude sectional testing and backfilling of the various systems. Trenches shall be carefully backfilled with approved sand, free from large earth clods, rocks, and/or foreign materials, laid in 6-inch layers, moistened thoroughly, and carefully rammed to an elevation of one foot above top of pipe. The remainder of the backfill to finish grade shall be placed in one foot layers soaked with water, and well tamped. Under roadways, backfill to bottom of road bed material with sand only. Where settlement occurs, trenches shall be re-opened to depth required for proper compaction, refilled, and compacted.

E. Open trenches abutting foundation or basement excavations, building walls, and grade beams, will not be permitted, but shall be backfilled and completed, for a distance of not less than 10' from the above features, as soon as possible. All damage resulting from flooding or other stresses due to open trenches shall be paid for by the Contractor.

F. Where excavation requires, existing walks, street, drives, or other existing pavement to be cut to install new lines and to make new connections to existing lines, the size of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new materials is completed and the excavation has been backfilled, the paving shall be patched, using materials to match those cut out. The patches shall be thoroughly bound with the original surfaces, and shall be level with them.

3.4 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to permit installation of any work under this section of the Specifications or to repair any defects that may appear, up to the expiration of the guarantee period, such cutting shall be done under the supervision of the Architect by the Contractor. The Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

B. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades occasioned by cutting operations, or occasioned by the failure of any par to work installed under this Contract, shall be performed by the trade whose work is involved, but shall be paid for by the Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.

3.5 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide his own hoisting facilities and scaffolding to set his materials and equipment in place, as indicated on Drawings and for subsequent cleaning, testing, and adjusting.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to the job, in accordance with intent of the documents.

3.6 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the project site.

B. The Contractor shall protect all equipment and piping during construction against entry of dust, debris, trash, etc. Openings into equipment, ductwork, and piping shall be covered until final connections are made. Prior to making final connections, clean both inside and outside of equipment and piping.

C. At completion of the job, the Contractor shall remove all of his tools, scaffolding, and surplus materials. He shall leave the area “broom clean”.

3.7 DEMOLITION AND RELOCATIONS

A. The Contractor shall modify, remove, and relocate all materials and items so indicated on the Drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials except asbestos shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner. Non-salvageable materials and equipment shall become the property of the Contractor and removed from the site.

B. The Contractor shall immediately notify the Owner of any area where the Contractor suspects or becomes aware of the existence of asbestos or other potentially hazardous materials on this project. It shall be the responsibility of the Contractor to provide written request to the Owner for the services of an Industrial Hygienist who shall provide all necessary testing, analysis and documentation of the status of any areas where asbestos or potentially hazardous materials exist. The Industrial Hygienist shall then prepare plans and specifications which provide for the removal of all potentially hazardous substances and their disposal in a lawful manner. The Contractor shall not remove or disturb asbestos or other potentially hazardous substances until he has obtained approval in writing of the methods he shall use from the authorities having jurisdiction.

C. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved. Where items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor’s responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at not additional cost to the Owner or the Architect. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and items of like design and quality in lieu of materials and items to be relocated.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner.

E. The Contactor before beginning work in existing areas shall send proper notices and receive written permission from the Owner to enter the areas, shall make necessary arrangements and perform other services required for the care, protection, and in-service maintenance of all mechanical, plumbing, electrical, communications and fire protection systems. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project. Outages or services as required by the new installations will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the Contract amount.

F. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork, and equipment, etc. to provide this access and shall reinstall same upon completion of work in the areas affected.

G. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, the Contractor shall remove and reinstall in locations approved by the Architect all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature control system devices, electrical switches, relays, fixtures, piping, conduit, etc.

H. The Contractor shall carefully measure existing facilities before preparing Shop Drawings.

I. The Contractor shall coordinate and make provisions for final connection to all fixtures, equipment and any connections to equipment furnished by others, for a complete and operating system

END OF SECTION

SECTION 220523 - PLUMBING VALVES

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Check Valves.

B. Ball Valves.

C. Butterfly Valves.

D. Balancing Valves.

E. Plug Valves.

F. Hose Bibbs.

G. Wall Hydrants.

H. Access Doors

1.2 SUBMITTALS

A. Submit manufacturer's product data by valve type listed in these specifications showing dimensions, sizes, materials, and pressure rating.

1.3 QUALITY ASSURANCE

A. Provide valves of same manufacturer throughout where possible.

B. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

C. Lead-free valves shall comply with NSF/ANSI 61, Annex F and NSF/ANSI 372. Lead-free valves shall be installed in systems that deliver water for human consumption**.**

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specifications Section 220500 for additional requirements.

A. Check Valves:
   1. Apollo
   2. Kitz.
   3. Milwaukee.
   4. NIBCO.
   5. Mueller.

B. Ball Valves:
   1. Apollo.
   2. Kitz.
   3. Milwaukee.
   4. NIBCO.
   5. Jomar

C. Butterfly Valves:
   1. Apollo.
   2. Centerline.
   3. Kitz.
   4. Milwaukee.
   5. Mueller
   6. NIBCO.

D. Balancing Valves:
   1. Armstrong.
   2. Bell & Gossett CB Series.
   3. Watts.
   4. Taco ACCU-Flo.
   5. NIBCO.
   6. Caleffi

E. Plug Valves:
   1. Flowserve Nordstrom.
   2. DeZurik.
   3. Milliken.
   4. Resun.
   5. Walworth.
   6. Homestead.

F. Wall Hydrants:
   1. Josam.
   2. Mifab.
   3. J.R. Smith.
   4. Wade.
   5. Woodford.
   6. Zurn.
   7. Watts.

G. Hose Bibbs:
   1. Chicago Faucet.
   2. Mifab.
   3. Woodford.

H. Access Doors:
   1. Karp.
   2. Mifab.
   3. Milcor.
   4. Acudor.

2.2 VALVE CONNECTIONS

A. Provide valves suitable for connection to adjoining piping. Use line size valves unless otherwise indicated.

B. Provide threaded ends for valves 2-1/2 inches and smaller.

C. Provided flanged ends for valves 3 inches and larger.

2.3 CHECK VALVES

A. Type A: Class 125, lead-free bronze body, Teflon disc, T-pattern, swing check design, threaded ends. NIBCO T-413-Y-LF. Milwaukee Valve UP509-300 WOG (Bronze Disc) Press Check Valves UP509-P2.

B. Type B: Class 125, lead-free cast iron body, wafer style, bronze disc, spring check design, NIBCO W-910-LF Milwaukee Valve F-2974M26.

C. Provide Check Valves as follows:

SERVICE	CHECK VALVE TYPE	
	2" and Under	2-1/2" and Larger
Domestic Cold Water	A	B
Domestic Hot Water	A	B

2.4 BALL VALVES

A. Type A: Bronze, lead-free, two piece body, stainless steel full port ball and stem, reinforced Teflon seat, 600 psi, threaded ends. NIBCO T-585-66-LF Milwaukee Valve UPBA-400S Press Ball Valves-UPBA-400S-P2.

B. Type B: Brass, lead-free, two-piece body, stainless steel full port ball and stem, reinforced Teflon seat, 400 psi, threaded ends. NIBCO T-FP-600A-LF Milwaukee Valve UPBA-475B-CP Ball Press Ball Valves UPBA-480S.

C. Provide ball valves as follows:

SERVICE	BALL VALVE TYPE	
	2" and Under	2-1/2" and Larger
Domestic Cold Water	A	B
Domestic Hot Water	A	B
Natural Gas	A	B

2.5 BUTTERFLY VALVES

A. Type A: Full threaded lug body, lead-free, lever operated, cast or ductile iron body suitable for a maximum working pressure of 150 psig, aluminum bronze disc, stainless steel stem, EPDM field replaceable seat, waterway must be clear of all bolts or pins, NIBCO LD-2000 Milwaukee Valve ML233E-LEVER and ML333E-GEAR.

B. Provide butterfly valves as follows:

SERVICE	BUTTERFLY VALVE TYPE
	3" and Larger
Domestic Cold Water	A
Domestic Hot Water	A

C. All butterfly valves shall be suitable for dead end service in both directions without a downstream flange.

2.6 BALANCING VALVES (Circuit Setter)

A. Type A: Balancing Valve:
   1. Calibrated nameplate.
   2. Full port ball valve.
   3. Max. Flow rate of 3 GPM.
   4. Threaded ends.
   5. (2) test plugs.
   6. Lead-free
   7. Bell and Gossett CB-3/4-LF

B. Provide Balancing Valves as follows:

SERVICE	BALANCING VALVES
	3/4" and Under
Domestic Hot Water Recirculation	A

2.7 PLUG VALVES

A. Type A: ASTM A-126 Class B cast iron body plug and cover, 175 CWP, 350 psig test, threaded ends. Rockwell-Nordstrom.

B. Type B: ASTM A-126 Class B cast iron body plug and cover, 175 CWP, 350 psig test, flanged ends. Rockwell-Nordstrom.

C. Provide plug valves as follows:

SERVICE	PLUG VALVE TYPE	
	2-1/2" and Under	3" and Larger
Natural Gas	A	B

2.8 WALL HYDRANTS

A. Wall Hydrant shall be concealed type Woodford Model B65 Series 3/4-inch non-freeze wall hydrant with straight inlet connection, bronze casing, vacuum breaker, loose key tee, satin chrome finish.

B. Wally Hydrant – Hot/Cold Water: Woodford #HCB67, 3/4" hot/cold water, non-freeze, vacuum breaker, loose key, satin chrome finish.

2.9 HOSE BIBBS

A. Toilet rooms (below lavatories) – hose bibb shall be Chicago No. 293-E27 chrome plated finish, brass wall faucet with vacuum breaker breaker and loose key tee handle.

B. Mechanical rooms – hose bibb shall be Woodford Model 24 brass finish, brass wall faucet with vacuum breaker and metal wheel handle.

2.10 VALVE OPERATORS

A. Provide extension stems for butterfly valves installed in insulated lines so that handle operation does not damage the insulation.

2.11 ACCESS DOORS

A. Provide access doors with concealed hinge and key operated locks. Access doors installed in walls finished with ceramic tile provide 16 ga., type 304 stainless steel access doors. Access doors installed in plaster or gypsum board walls or ceilings provide 14 ga. prime coated steel access doors.

B. Acceptable Manufacturers:
   1. Accudor
   2. Elmdor.
   3. Mifab.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Butterfly valves shall be mounted with the stem horizontal whenever possible.

B. Install ball or butterfly valves for shut-off and isolating service, to isolate equipment, part of systems, or vertical risers.

C. Provide shut-off valves and check valves on discharge of pumps.

D. Provide access doors where valves are installed concealed in pipe chases or above inaccessible ceilings. Door shall be large enough to service valves and shall be installed flush with finished walls and ceilings.

E. Provide a balancing valve downstream of the hot water recirculating pump.

F. Ball valves for gas service are permitted for connection of rooftop equipment or interior spaces.

END OF SECTION

SECTION 220529 - PLUMBING SUPPORTS AND ANCHORS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Inserts and Rods.

B. Pipe Hangers and Supports.

C. Pipe Penetration Sleeving and Sealing for All Services.

1.2 SUBMITTALS

A. Submit shop drawings on proposed methods and materials including hangers, hanger attachments, wall supports, trapeze supports, floor supports, submit details of pipe penetrations, sleeves, sealing and UL approved fire stop assemblies.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacturer's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specification Section 220500 for additional requirements.

A. Anvil.

B. B-Line.

C. Erico.

D. Tolco.

E. Unistrut.

2.2 INSERTS AND RODS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Where concrete slabs form finished ceiling, finished inserts, flush with slab surface.

C. Provide electrogalvanized steel hanger rods, threaded both ends, threaded one end or continuous threaded.

D. Size inserts to suit threaded hanger rods.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers: Pipe sizes 1/2 inches to 12 inches; adjustable galvanized steel clevis. Anvil No. 260.

B. Hangers: Pipe sized 6 inches and over; adjustable galvanized steel yoke. Anvil No. 181.

C. Multiple or Trapeze Hangers: Steel channels with hanger rods.

D. Wall Support: Pipe sizes to 3 inches; welded galvanized steel bracket. Anvil No. 194.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded galvanized steel bracket. Anvil No. 195

F. Vertical Support: Galvanized Steel riser clamp. Anvil No. 261.

G. Expansion Anchors: Phillips Red Head or HILTI.

H. Steel Beam Clamps: Anvil No. 92, 93, 94.

2.4 FLASHING

A. Lead flashing: 5 lb./sq. ft. sheet lead for water-proofing, one lb./sq. ft. sheet lead to soundproofing.

B. Refer to Roofing Drawings and specifications.

2.5 SLEEVES AND SEALANTS

A. Piping Through Masonry or Concrete Walls, Concrete Footings and Beams and Concrete Floor: Schedule 40 galvanized steel pipe.

B. Piping Through Fire Rated Walls: 18-gauge galvanized sheet metal. Seal with UL approved fire stop assembly utilizing an intumescent foam sealant.

PART 3- EXECUTION

3.1 INSERTS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, finish inserts, flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. All structures and appurtenances employed for the purpose of supporting the pipe and guiding it properly shall be carefully fabricated in such a manner as to preserve the true grade of the pipe without subjecting either the pipe or the supporting and guidance members to any undue strain.

B. Support horizontal piping and provide hangers and rods at each change in direction. Spacing shall comply with Manufacturer's Standardization Society (MSS) Standard Practice SP-69 or as required by the Plumbing Code. In cases of conflict between the specifications and this Standard, the most stringent requirements shall govern. Refer to hanger spacing table below:

HANGER SPACING TABLE

Hanger Spacing, ft.				
NPS, In.	Standard Steel Pipe		Copper Tube	Rod Size, In.
	Water	Steam	Water	
1/2	7	8	5	1/4
3/4	7	9	5	1/4
1	7	9	6	1/4
1-1/2	9	12	8	3/8
2	10	13	8	3/8
2-1/2	11	14	9	3/8
3	12	15	10	3/8
4	14	17	12	1/2
6	17	21	14	1/2
8	19	24	16	5/8
10	20	26	18	3/4
12	23	30	19	7/8
14	25	32		1
16	27	35		1
18	28	37		1-1/4
20	30	39		1-1/4

Source: MSS Standard SP-69

C. Support horizontal cast iron soil pipe within 12" of each hub and as required by C.I.S.P.I. Standards, with 5 feet maximum spacing between hangers. Provide hangers on both sides of the coupling for pipe 12 inches and larger.

D. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.

E. Place a hanger within one foot of each horizontal elbow.

F. Use hangers which are vertically adjustable 1-1/2 inches minimum after piping is erected.

G. Support piping at each change of direction, at ends of branches, at base and top of riser pipes and drops, and wherever necessary to prevent sag, bending or vibration, in addition to above-listed hanger spacing.

H. Support vertical piping at every floor. Support vertical soil pipe at each floor at hub.

I. Pipe hangers on insulated lines shall be sized to fit the outside of the insulation.

J. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers, designed to support loads per ANSI B31.1.

K. Where practical, support riser piping independently of connected horizontal piping.

L. Hangers shall be anchored to the side of existing concrete joists or beams. Drilling and anchoring threaded rod to the underside of existing concrete slabs is prohibited.

M. Piping installed on trapeze hangers shall be completely insulated and not anchored directly to the trapeze rack. Pipe straps shall be sized to fit over the insulated piping.

N. Provide two layers of PVC tape, where hangers and supports are in direct contact with the copper pipe.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Except as otherwise specified or indicated on the drawings, provide for major equipment minimum four inches thick, 6 X 6 – 10/10 mesh reinforced concrete house-keeping bases poured directly on structural floor slab pinned in place and extended 6 inches minimum beyond machinery bedplates. Provide 45 degrees by one inch bevel of top surface edge along concrete base. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment. Coordinate with other trades.

B. Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

C. Grout all bases of base mounted pumps in solid to concrete pad with non-shrink epoxy grout.

3.4 PRIMING

A. Prime coat non-galvanized or non-plated steel hangers, reinforcements and supports.

3.5 FLASHING

A. Refer to Roofing Drawings and specifications.

3.6 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through floors 2 inches above finished floor. Caulk sleeves full depth.

C. Sleeves through walls shall be flush with the finished wall surface.

D. Size sleeves large enough to allow for movement due to expansion, to allow insulation to extend through the sleeve uninterrupted and to allow space for proper sealing.

E. Install fire stop assemblies in strict accordance with manufacturer’s printed installation instructions and provisions of UL rating.

F. Install chrome plated escutcheons where piping passes through finished surfaces.

G. Pipe and duct sleeves, pitch pockets, chem-curbs, and flashings compatible with the roofing installation shall be provided for roof penetrations. Refer to Roofing Drawings and specifications.

END OF SECTION

SECTION 220553 - PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pipe Identification.

B. Equipment Identification.

1.2 SUBMITTALS

A. Submit product data describing materials and methods of attachment for each type of identification device.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The product of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specifications Section 220500 for additional requirements.

A. Brady.

B. Seton.

C. Brimar

2.2 PIPE IDENTIFICATION

A. Pipe markers shall be suitable for all temperatures anticipated in system down periods as well as operational times.

B. Adhesive markers shall be made of vinyl cloth with extra strong adhesive (32 oz. per inch width) and shall have a silicone plastic overcoating. Surface preparation shall be as prescribed by the manufacturer. The adhesive marker shall be used on indoor applications only.

C. All plastic snap over type pipe identification shall be outdoor grade acrylic plastic. Strap on construction shall be used on pipe size (including insulation) six inches and over.

D. Each marker shall indicate direction of flow with an arrow pointing away from the marker. When flow can be in each direction the marker shall have double ended arrows.

E. The marker shall comply with ANSI A13.1 and ANSI Z53.1 for scheme and color codes.

F. Letter style shall be bold and easy to read, similar to Sans Serif Gothic bold.

G. Pipe identification markers and arrow flow markers shall be provided on the following piping systems:
   1. Domestic Hot Water
   2. Domestic Hot Water Recirculating
   3. Domestic Cold Water
   4. Sanitary Sewer
   5. Sanitary Vent
   6. Natural Gas
   7. Roof Drain Piping
   8. Soft Water
   9. Condensate Collection

2.3 VALVE IDENTIFICATION

A. Valve tags shall have valve number corresponding with the valve schedule.

B. Each valve tag shall be minimum 20-gauge polished brass not less than 1/1/2 inches in diameter. Each tag shall identify service (1/4-inch stamped letters) and valve number (1/2-inch letters).

C. Tags shall be secured to the valve with approved meter seal, Brass “S” hook, Brass jack chain, or other approved methods.

D. Abbreviations for service shall be as follows with the system designation indicating the system served. (Note: color coded aluminum tags may be used for this purpose in lieu of brass tags).

ABBREVIATIONS For Service

DCW	Domestic Cold Water
DHWS	Domestic Hot Water Supply
DHWR	Domestic Hot Water Recirculating
SW	Soft Water
GAS	Natural Gas

2.4 EQUIPMENT IDENTIFICATION

A. Equipment identification tags shall identify the function and use of the equipment in language corresponding to the drawings and schedules.

B. Aluminum nameplates shall be minimum 2-1/2”x3/4” with black enamel background with etched or engraved natural aluminum lettering not less than 1/4-inch high.

C. Engraved laminated plastic nameplates may be used on indoor equipment minimum 2-1/2” x 3/4” with 1/4-inch high lettering and contrasting letter color.

PART 3– EXECUTION

3.1 INSTALLATION

A. All identification shall be located so that the view is unobstructed.

B. Attachment of all identification tags or plate shall be permanent, suitable for the location and located so as to not interfere with system operation or maintenance.

C. Equipment manufacturers nameplates or identification shall not be obscured.

3.2 PIPE IDENTIFICATIONS

A. Use a pipe marker at each valve to show proper identification of pipe contents. Where several valves exist on one header, it is necessary to mark only the header.

B. Apply a pipe marker and an arrow marker at every point of pipe entry or exit or where line goes through a wall.

C. Apply pipe markers and arrow markers at intervals not exceeding 25 feet.

D. Apply markers around circumference of pipe where view is unobstructed in open and service areas above ceiling.

3.3 VALVE IDENTIFICATION

A. Identify each valve in a manner that will permit free operation of the valve.

3.4 EQUIPMENT IDENTIFICATION

A. All pieces of major equipment shall be identified as to function and distinguished number.

B. Plates shall be attached with screws or rivets.

END OF SECTION

SECTION 220700 - PLUMBING INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

1.2 SUBMITTALS

A. Submit manufacturer's product data including:
   1. Schedule of materials by service showing thickness and finish.
   2. Thermal properties.
   3. Adhesives and sealants.
   4. Installation procedures.

1.3 QUALITY ASSURANCE

A. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness.

B. Perform work at temperatures recommended by the adhesive manufacturer.

C. Insulation shall be applied to clean dry surfaces. Piping shall be tested before insulation is applied or joints shall be left uncovered until leak test have been performed.

D. All insulation shall have composite fire and smoke hazard ratings (insulation, jacket and adhesive used to adhere jacket or facing to the insulation), as tested by procedure ASTM E-84, NFPA 255 and UL 73 not exceeding Flame Spread of 25, Fuel Contributed of 50 and Smoke Developed of 50. All other components such as adhesives, mastics (except joint sealer), cements, tapes and cloths, etc. shall also meet these ratings. ASTM-E84-25/50 rating should be clearly marked on each joint of insulation.

E. Insulation materials shall be formaldehyde-free.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacturer's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specification Section 220500 for additional requirements.

A. Insulation:
   1. Knauf.
   2. Manson
   3. Johns Manville.

B. Adhesives, Sealants and Finishes:
   1. Childers.
   2. Foster.

3. 3M.

C. PVC Fitting Covers
   1. Proto.

D. Aluminum Jacketing
   1. ITW Insulation Systems.
   2. GLT Products.

2.2 MATERIALS

A. Mineral Wool Pipe Insulation: Pre-molded pipe covering with white All Service Jacket and pressure sensitive adhesive longitudinal lap seal, formaldehyde-free. Manufacturer: Knauf Earthwool.

B. Mineral Wool Blanket: Glass blanket with Foil Scrim Kraft vapor barrier jacket, formaldehyde-free. Manufacturer: Knauf Earthwool.

C. Fittings Covers: One/Two piece pre-molded PVC, 25/50 smoke rated, white glass finish.

D. Aluminum Roll Jacketing: 0.016 inch thick aluminum jacketing and fittings.

E. Vapor Barrier Adhesive: Low-odor vapor barrier. ASTM-84.

PART 3– EXECUTION

3.1 PREPARATION

A. Do not install covering before piping and equipment have been tested and approved.

B. Ensure surface is clean and dry prior to installation.

C. Apply finishes with system at ambient conditions.

3.2 INSTALLATION

A. Install all insulation and apply all sealants, and finishes in strict accordance with manufacturer's printed installation procedures.

B. Insulation shall be continuous through wall, floor and ceiling openings and sleeves.

C. At all pipe hanger locations where the insulation must resist compression and piercing, supporting devices must be used in combination with metal hanger shields. Supporting devices such as foamglass dowels which have the same thickness of the insulation shall be used. Coat the dowel with an approved adhesive before insertion into the insulation and coat the outer surface to provide a vapor seal.

D. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

E. Locate seams in least visible locations.

F. Glass Mineral Wool Pipe Insulation:

1. Apply insulation to pipe and seal longitudinal seam with pressure sensitive adhesive lap. Seal butt joints with vapor barrier adhesive. Finish with vapor barrier adhesive and 4-inch strips of facing material. Overlap adjacent pipe 2 inches minimum.
2. Seal ends of pipe insulation at valves, fittings, flanges, etc. and on continuous runs with vapor barrier sealant.
3. Fittings: Apply insulation to the same thickness as the adjoining pipe. Finish with white PVC fitting covers and seal all joint with PVC adhesive and PVC tape. Finish shall overlap adjacent insulation by 2 inches minimum.
4. Valves, Strainers, Unions, and Flanges Cold Service: Provide insulation with tapered ends. Apply vapor barrier adhesive to all tapered joints.
5. Valves, and Strainers Hot Service: Insulate valves as described above for cold service.
6. Protect insulation at hangers, guides and rollers with 16-gauge galvanized metal saddles with metal bands on both ends of the saddle.
7. Insulate P-traps of floor drains and hub drains receiving condensate from air conditioning units.
8. Insulate all PVC piping located in return air plenums.

G. Glass Mineral Wool Blanket Insulation:
1. PVC piping in return air plenums shall be insulated with plenum rated pipe insulation.
2. Overlap the facing on longitudinal seam a minimum of 2 inches and seal with 100% coverage of adhesive. Staple in place with outward clinch staples.
3. Seal all staple and fastener penetrations and any other breaks in the vapor barrier with vapor barrier mastic.

H. Roof Drain Insulation:
1. Insulate bodies of roof drains and horizontal runs of pipe up to and including first vertical elbow.
2. Roof drain bodies shall be insulated with Earthwool blanket insulation.
3. Exposed drain piping shall be insulated with rigid Earthwool pipe insulation.

3.3 FINISHES

A. Finish piping exposed outdoors with aluminum jacketing secured with aluminum bands. Provide pre-molded aluminum fitting covers for fittings, valves, etc. Seal all joints with clear silicone sealant.

3.4 MATERIAL SCHEDULE

A. Piping

1.	Domestic Cold Water.	- glass mineral wool
2.	Domestic Hot Water.	- glass mineral wool
3.	Domestic Hot Water Re-circulation.	- glass mineral wool
4.	Condensate Drain.	- glass mineral wool
5.	Roof Drain Bodies and Piping.	- glass mineral wool
6.	Emergency Overflow Drain.	- glass mineral wool
7.	PVC in Return Air Plenums	- glass mineral wool (plenum rated)

3.5 INSULATION THICKNESS SCHEDULES - PIPE

Minimum Pipe Insulation Thickness (in inches)							
Fluid Operating Temperature Range and Usage (°F)	Insulation Conductivity		Nominal Pipe or Tube Size (inches)				
	Conductivity Btu▪in./(h▪ft²▪°F)	Mean Rating Temperature, °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≤8
>350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
85-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-84	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

END OF SECTION

SECTION 220800 - COMMISSIONING OF PLUMBING SYSTEMS

PART 1– GENERAL

1.1 COMMISSIONING AGENCY

A. The commissioning agency (CA) has been contracted directly with the owner for this project. The CA has overall responsibility for planning and coordinating the commissioning process. However commissioning involves all parties to the design and construction process, including the Plumbing (Division 22) Contractor, and all specialty sub-contractors within Division 22, such as insulation, medical gas, and major equipment suppliers as required.

1.2 CONTRACTOR RESPONSIBILITY

A. The Plumbing (Division 22) Contractor's responsibilities are defined in Division 01 of the specifications. These responsibilities apply to all specialty sub-contractors and major equipment suppliers within Division 22. Each contractor and supplier shall review Division 01, and their bids shall include for carrying out the work described, as it applies to each Section within the Division 22 specifications, individually and collectively.

PART 2– PRODUCTS: NOT APPLICABLE

PART 3– EXECUTION: NOT APPLICABLE

END OF SECTION

SECTION 222000 - PLUMBING PIPING AND SPECIALTIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Sanitary Waste and Vent Piping Systems.

B. Domestic Cold and Hot Water Piping Systems.

C. Roof Drain Piping System.

D. Cleanouts.

E. Water Hammer Arrestors.

F. Trap Primers.

G. Backflow Preventers.

H. Thermometers and Pressure Gauges.

I. Pressure Reducing Valves.

1.2 SUBMITTALS

A. Submit minimum 1/4-inch scale shop drawings of piping systems, double lined for piping 4 inches and over, accurately drawn and carefully coordinated with all other trades. Show bottom of pipe elevations or sections.

B. Pipe and Pipe Fittings: Manufacturer's data showing materials, ASTM designation, dimension and schedule.

C. Cleanouts: Manufacturer's product data showing dimensions, materials and surface application.

D. Backflow Preventor: Manufacturer's product data showing dimensions, materials and capacity.

E. Thermometers and Pressure Gauges: Manufacturer's product data showing dimensions, materials and scale ranges.

F. Pressure Reducing Valves: Manufacturer's product data showing dimensions, materials and capacity.

1.3 QUALITY ASSURANCE

A. Lead-free components shall comply with NSF/ANSI 61, Annex F and NSF/ANSI 372. Lead-free components shall be installed in systems that deliver water for human consumption**.**

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to Specifications Section 220500 for additional requirements.

A. Cleanouts:
   1. Josam.
   2. MIFAB
   3. J.R. Smith
   4. Wade.
   5. Zurn.
   6. Watts.

B. Water Hammer Arrestors:
   1. Josam.
   2. MIFAB
   3. J.R. Smith
   4. Wade.
   5. Zurn.
   6. Watts.

C. Trap Primers:
   1. Precision Plumbing Products.
   2. MIFAB.

D. Backflow Preventors:
   1. Cla-Val.
   2. Febco.
   3. Hersey.
   4. Watts.

E. Thermometers and Pressure Gauges:
   1. Ernst.
   2. Trerice.
   3. Weksler.
   4. MILJOCO
   5. Weiss.

F. Pressure Reducing Valves:
   1. Wilkins.
   2. Watts.

G. Trap Primer Adapter Fittings:
   1. Josam.
   2. MIFAB.
   3. J.R. Smith.
   4. Wade.
   5. Zurn.
   6. Watts.

H. Cast Iron Soil Pipe and Fittings
   1. A.B. & I. Foundry.
   2. Charlotte Pipe and Foundry.
   3. Tyler Pipe.

I. Heavy Duty Hubless Cast Iron Couplings
   1. Husky.
   2. Mission.
   3. Ideal.
   4. MIFAB

J. Stainless Steel In-Building Riser
   1. Ames.
   2. Wilkins.

K. Press-Fit Fittings
   1. Apollo
   2. Merit
   3. NIBCO
   4. Viega

L. PEX-A Domestic Water Piping
   1. Uponor

2.2 PIPE AND PIPE FITTINGS

A. Refer to Section 220500 for general materials and methods.

B. Sanitary waste vent piping underground to 5 feet outside the building shall be Schedule 40 DWV-PVC with solvent weld joints; ASTM D-1785, ASTM D-2265.

C. Sanitary waste and vent piping above the floor shall be hubless cast iron pipe with Husky No. SD4000 heavy duty couplings; ASTM A-888, CISPI 301, ASTM C 1540.

D. Roof drain piping underground to 5 feet outside the building shall be Schedule 40 DWV-PVC with solvent weld joints; ASTM D-1785, ASTM D-2265.

E. Roof drain piping above the floor shall be hubless cast iron pipe with Husky No. SD4000 heavy duty coupling; ASTM A-888, CISPI 301, ASTM C1540.

F. Roof drain piping above the floor shall be Schedule 40 PV-PVC with solvent weld joints; ASTM D-1785, ASTM D-2265.

G. Domestic water piping aboveground shall be Type L hard temper copper tube with wrought copper fittings with lead-free solder joints; ASTM B88.

H. Domestic water piping aboveground shall be Type L hard temper copper tube with press-fit type joint system.

I. Domestic water piping aboveground, 3” and smaller, shall be PEX-A, cross-linked polyethylene flexible polymer tubing, plenum rated, ASTM F876 and ASTM F877. Joints shall be cold expansion type. Piping shall be in straight lengths only.

J. Slab-on Fill Domestic Water Service Entrance Piping:
   1. 1-1/2” and Smaller: PVC tape wrapped Type “K” copper, ASTM B-88.

2. 2” and Larger: In-Building Riser; 304 stainless steel, one-piece 90 degree fitting, 175 PSI working pressure, grooved-end outlet, CIPS inlet end.

K. Condensate Collection System piping shall be Type L Copper with soldered joints or press-fit joints.

L. Trap Primer Tubing Cast in the Slab: Type “K” soft copper, without joints or PEX-A, cross-linked polyethylene flexible polymer tubing.

M. Trap Primer Tubing Suspended Below the Floor: Type “L” copper or PEX-A, cross-linked polyethylene flexible polymer tubing.

N. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

O. Heavy-Duty, Shielded, Stainless Steel Couplings: Stainless steel shield, four stainless steel bands and tightening devices, ASTM 564 rubber sleeve. Husky SD4000 Series.

P. Cast Iron to PVC Transition Couplings: Stainless steel clamp, screws and shield with neoprene gasket, ASTMc1460, C564. Husky SD4200 transition couplings. Use in aboveground installations.

Q. Indirect Drain Piping Ice Machines: Provide full-size Schedule 40 PVC piping with solvent weld joints.

R. Indirect Drain Piping – Mechanical Equipment: Provide full-size Type L copper with soldered joints or Schedule 40 black steel with threaded joints. Provide Schedule 40 PVC with solvent weld joints for drain piping carrying corrosive condensate from condensing type water heater/boilers and from water softener backwash.

2.3 VALVES

A. Valves shall be in accordance with Section 220523.

2.4 SUPPORTS, ANCHORS AND SEALS

A. Provide supports, anchors and seals in accordance with Section 220529.

2.5 CLEANOUTS AND CLEANOUT ACCESS COVERS

A. Provide caulked or threaded type extended to finished floor or wall surface.

B. Floor Cleanout Access Covers in Unfinished Areas: Round with nickel bronze frames and plates; Wade #6000.

C. Floor Access Covers in Finished Areas: Round nickel bronze frame and plates, Wade #6000. Cleanouts to be suitable for floor surface. Refer to Architectural Plans.

D. Wall cleanouts to have chrome plated or stainless steel caps, Wade #8550 Or #8560.

E. Yard Cleanouts: Round cast iron cleanout housing with cast iron tractor type cover and bronze cleanout plug; Mifab #C1300-MF.

F. All cleanout plugs shall be brass/bronze.

2.6 WATER HAMMER ARRESTORS

A. Install stainless steel bellows or piston type water hammer arrestors on water lines connected to flush valves and to groups of fixtures. Selection of water hammer arrestors shall be per Plumbing and Drainage Institute rating for fixture unit capacity served. Refer to plumbing risers or plans for location and size.

2.7 TRAP PRIMER VALVES

A. Electronic Trap Primers: Shall be Precision Plumbing Products model PT 4-30; flush mount or PTS 4-30; surface mount, as indicated on the drawings. The unit shall be factory assembled, prepiped and shall include a bronze 3/4" female NPT, WOG rated inlet ball valve, a brass 3/4" electronic solenoid valve and a type "L" copper manifold with (1/2" , 5/8") brass compression fittings. Unit shall include a single point power connection at 120/1/60, a manual override switch, 2 amp breaker and geared 24 hour timer with relay and 5 second dwell function. A code approved atmospheric vacuum breaker shall be included for backflow protection. Complete unit shall be provided in a 16 gauge steel box with access door suitable for flush mounting or a NEMA 1 rated box with cover for surface mounting.

2.8 BACKFLOW PREVENTION

A. Provide a lead-free reduced pressure principle backflow assembly in the main water line to the building and/or as indicated on plans:
   1. All backflow preventers shall be tested and certified as complying with U.S.C. Cross Connection Control Lab/U.S. Army Corps of Engineers/ U.S. Navy/Southern Building Code Congress/AWWA/ASSE/CSA B64.4.
   2. Complete with ball valves on both sides of backflow preventer.
   3. Bronze and stainless steel trim.
   4. Bronze ball valve test cocks.
   5. Provide air gap funnel for all units installed inside the building.
   6. Watts #909 LF-QT-AG.

B. Provide a lead-free double-check backflow assembly where noted on the plans and as specified in this section. Watts #709-QT.

C. Provide a lead-free double-check stainless steel backflow assembly for connections to carbonated water systems. Watts #SS007.

2.9 THERMOMETERS AND THERMOMETER WELLS

A. Provide 9-inch, aluminum case, brass stem, adjustable angle, mercury red reading type thermometers where shown on the drawings.

B. Provide brass separable sockets of the correct length for the pipe size in which they are installed, with extension necks when installed in insulated piping.

C. Ranges shall be as follows:

Domestic Hot Water	30 degrees F to 240 degrees F

D. Brass industrial test wells, 3/4-inch N.P.T., with cap and chain. Test wells shall be the correct length for the pipe size in which they are installed.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's instructions.

B. Slope drainage lines minimum 1/8-inch per foot, 1/2-inch per foot maximum for waste lines, as required by the Plumbing Code.

C. Coordinate pad requirements for both size and vibration control. Provide auxiliary water piping and drains necessary to the operation of the equipment. Vent as required and approved by authorities having jurisdiction.

D. Furnish vibration isolation mounting pads for equipment with electric motors.

E. Provide flexible connections in piping where indicated on drawings or required.

F. Confirm final connections to fixtures and equipment prior to performing work.

G. Bring exterior cleanouts up to grade. Provide concrete box with cast iron cover over each exterior cleanout.

H. Flush piping clean with water after installation.

I. When conditions are such that the connecting pipe cannot be adequately supported on undisturbed earth or compacted backfill, it shall be encased in concrete or supported in a concrete cradle.

J. Piping installed underground shall be laid on a 6" sand bed and encased in 6" of sand on all sides of the pipe prior to backfilling the trench.

K. Refer to 220529 for rooftop pipe supports.

3.2 WATER PIPING

A. Provide water hammer arrestors, complete with access doors, where indicated on drawings.

B. Before sterilizing, thoroughly flush all domestic water lines.

C. Disinfect lines with fluid chlorine or hypochlorite. Introduce sufficient chlorine to provide an initial concentration of 50 p.p.m. disinfect for 24-hour period, opening and closing valves in system at various points during disinfection. Following chlorination, thoroughly flush complete system until replacement water is comparable in quality to water from the water supply system. Submit certification that specification and all ordinances and regulations have been complied with.

D. Insulate piping in accordance with Section 220700.

E. Identify piping and valves in accordance with Section 220553.

F. Provide access doors for concealed trap primer valves.

G. Access doors shall be in accordance with Section 220523.

H. Copper water piping cast in the slab shall be installed without joints and wrapped in a plastic sleeve.

I. Copper water service entrance risers installed below slab-on-fill construction shall be completely wrapped with PVC tape.

J. Provide a reduced pressure zone backflow preventer on the make-up water supply to mechanical equipment.

K. Copper press-fit type joints, shall be installed in accordance with the manufacturers instructions.

L. PEX tubing and fittings shall be installed in accordance with the manufacturer's instructions. Installers shall be trained by the Manufacturer's representative.

M. Provide an ASSE 1015 compliant backflow preventer at all coffee machines, carbonated and non-carbonated beverage dispensers.

N. Provide an ASSE 1015 compliant backflow preventer at all carbonated beverage dispensers.

O. Provide a double-check backflow preventer on water softener supply line.

P. Provide a double-check backflow preventer on ice machine supply line.

3.3 WASTE AND VENT PIPING

A. Slope soil and waste lines inside and outside building in accordance with requirements of governing Plumbing Codes, in flow direction shown on drawings.

B. Establish grade lines with surveyor's level. Verify location of sewer taps before start of work and make necessary grade adjustments. Drain vent lines back to waste lines.

C. Locate cleanouts at each change of line direction of more than 45 degrees and at maximum 50' intervals within the building and 100' intervals outside the building. Cleanouts shall be line size for mains up to 4 inches and shall be 4 inches for all larger mains.

D. Copper trap primer tubing cast in the slab shall be installed without joints and wrapped in a plastic sleeve.

E. Rigid copper trap primer tubing suspended below structure shall be connected to the floor drain outlet with a trap primer adapter fitting. Vertical connections to the trap primer tap on the floor drain body are prohibited.

F. Ensure ample clearance at cleanout for rodding of drainage system.

G. Soil piping headers serving wall mounted water closets and urinals shall have the wall cleanouts installed 6-inch above the flood rim of the fixture.

H. Terminate indirect waste piping with an air gap over the drain. Provide a union for drain piping serving mechanical equipment.

I. Underfloor piping in the crawl space shall be installed with 12 inches minimum clearance below the piping.

3.4 DIELECTRIC UNIONS

A. Install dielectric unions of flanges where copper or brass piping connects to ferrous piping or equipment.

3.5 THERMOMETERS AND THERMOMETER WELLS

A. Install thermometers with scales upright and in a location where they may be easily read.

B. Install thermometer wells where shown and where required to test and adjust the system.

C. Provide a thermometer on the water heater outlet.

D. Where mixing valves are installed provide thermometers on the hot water inlet, tempered water outlet and at the 1/2" hot water return inlet.

3.6 TESTING

A. Notify the Engineer one week prior to all testing.

B. Test piping systems prior to the application of insulation.

C. For piping installed in concealed space or buried, test piping before system is concealed or backfilled.

D. Test water piping to a hydrostatic pressure of 100 psig for a continuous period of not less than eight hours. During this time, carefully inspect the system for leaks. If necessary, repair leaks and test again until no leakage is detected.

E. Test sanitary drainage system and roof drain system by plugging lines and filling system with water to a static head of 10 feet of water. Observe water level for 24-hour period. If level is lowered indicating leakage, repair leaks and test again until no leakage is detected.

F. After testing and whenever conditions permit, operate systems at normal operating pressure and temperature for not less than five consecutive days. The piping system must remain free from leaks during this period.

G. The grease interceptor shall be completely filled with water for 24 hours and observed for leaks prior to backfilling.

H. All testing shall be approved by the Engineer.

I. Use higher pressure if required by authorities having jurisdiction.

3.7 SERVICE CONNECTIONS

A. Before commencing work check invert elevations required for sanitary sewer or storm drain connections, confirm inverts and ensure that these can be properly connected with slope for drainage.

B. Provide backflow preventer where indicated on the drawings.

C. Provide thrust blocks on underground water piping.

D. The Contractor shall provide the piping and make the final connection to the utility stub-outs.

END OF SECTION

SECTION 223400 - STORAGE WATER HEATERS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Gas Fired Water Heaters.

B. Hot Water Recirculating Pumps

C. Domestic Hot Water Expansion Tanks

D. Vacuum Relief Valves

E. Safe Pans

1.2 SUBMITTALS

A. Submit manufacturer's dimensional data, materials and instruction in accordance with Section 220500.

1.3 QUALITY ASSURANCE

A. Water heaters shall be stamped for 150 psi working pressure.

1.4 WARRANTY

A. Provide three year warranty on water heaters.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 220500 for additional requirements.

A. Gas Water Heaters:
   1. A.O. Smith.
   2. Bradford White.
   3. Rheeem.
   4. State.

B. Recirculating Pumps
   1. Armstrong
   2. Bell and Gossett
   3. Grundfos
   4. Taco

C. Domestic Hot Water Expansion Tanks
   1. Amtrol
   2. Bell & Gossett
   3. Elbi
   4. Watts

D. Vacuum Relief Valves
   1. Watts

E. Safe Pans
   1. Watertite

2.2 GAS FIRED WATER HEATERS

A. Water heater shall be glass lined.

B. Thermostatic control and safety shut off shall be product of the same manufacture installed on the water heater.

C. Provide anode rod.

D. Finish to be factory baked enamel outer casing.

E. Heater shall have factory 3/4-inch NPT for mounting of anode rod and safety relief valve independent of water inlet and outlet.

F. Storage volume, recovery rate and capacity shall be as scheduled on the Drawings.

2.3 HOT WATER RECIRCULATING PUMPS

A. Pumps shall be horizontal in-line type, lead-free, oil lubricated type, with a bronze body.

B. Connections shall be screwed or flanged type.

C. Inpellers shall be bronze, stainless steel, or brass

D. The shaft shall be heat treated carbon steel or stainless steel.

E. Motors up to 1/2 horsepower shall be 115 volt – single phase.

F. Pumps shall be furnished with an automatic programmable timer and Aquastat.

G. Gallons per minute, horsepower, and voltage shall be as scheduled on the drawings.

2.4 RELIEF VALVE

A. Provide temperature and pressure safety relief valves suitable for application and capacity according to local codes and national standards.

2.5 DOMESTIC HOT WATER EXPANSION TANKS

A. The expansion tanks shall be pre-charged diaphragm type steel vessels, complete with FDA approved butyl or polypropylene diaphragm. The tank shall include an air charging valve.

B. Refer to Plumbing drawings for tank acceptance and volume capacities.

2.6 SAFE PANS

A. The safe pan shall be 20 gauge aluminum, with pre-drilled 1" PVC drain connection.

B. Pan size shall allow ample clearance of water heater within the pan.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's instructions.

B. Provide shut off valves in accordance with Section 220523 with unions for service when necessary.

C. Pipe relief valve to suitable drain using pipe the same size as the relief valve opening.

D. Provide a thermometer on the water heater outlet. Refer to 222000.

3.2 GAS FIRED WATER HEATERS

A. Install draft hood and vent with minimum 1/4-inch per foot rise on vertical runs with flue pipe of same size as draft hood.

B. When power from external source is required connect to 120-volt, 1-phase, 60 Hz, separately fused disconnect switch in accordance with Division 26.

C. Purge gas line of all debris prior to final connection.

D. Regulator vents shall be full size run to outside the building. Avoid traps and terminate away from doors, windows and air intakes.

E. Pressure test prior to final hookup.

F. Fill heater and vent air pocket prior to applying heat.

3.3 HOT WATER RECIRCULATING PUMPS

A. Pumps shall be installed in the horizontal position, with easy access to the oil-fill port.

B. Pumps shall be independently supported from the wall, floor or structure. Pumps shall not be supported by the piping system.

C. Provide a shut-off valve on the inlet and outlet of the pump. Provide a check valve and balancing valve (circuit setter) on the pump outlet. Refer to Section 22 05 23, Plumbing Valves.

3.4 VACUUM RELIEF VALVES

A. Provide a vacuum relief at all water heaters and as detailed on the drawings.

3.5 SAFE PANS

A. Provide safe pans for water heaters suspended above the floor, and above the ceiling.

3.6 TESTING

A. Allow water heater to obtain operating temperature and cycle off. Run water from faucet until the heater cycles on to assure proper operations.

B. Operate heater for a minimum of 5 days and verify all connections are leak free.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES (COMMERCIAL)

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Plumbing Fixtures.

1.2 SUBMITTALS

A. Fixture and Associated Trim: Manufacturer's product data showing dimensions, certifications, materials and installation instructions.

1.3 QUALITY ASSURANCE

A. All faucets, drinking fountains and water dispensing devices shall comply with N.S.F. Standard 61, Section 9.

B. All plumbing fixtures and trim shall be manufactured in the U.S.A.

C. All water faucets and valve bodies shall be cast bronze.

D. All faucets, fittings and similar devices shall be of one manufacturer, unless otherwise specified. Faucets shall contain standardized, interchangeable cartridges.

E. All exposed parts shall be chrome plated.

F. Lead-free components shall comply with NSF/ANSI 61, Annex F and NSF/ANSI 372. Lead-free components shall be installed in systems that deliver water for human consumption**.**

1.4 DELIVERY, STORAGE AND HANDLING

A. Plumbing fixtures shall be stored in their own shipping boxes and protected from damage during construction.

PART 2– PRODUCTS

2.1 WATER CLOSETS

A. Type P-1 (Handicapped): American Standard "MADERA-FLOWISE 16-1/2" HEIGHT" #3043.001; High Efficiency Toilet, floor mounted, vitreous china, 1.28 gallons per flush, elongated bowl, siphon jet, 1-1/2-inch top spud, floor outlet and bolt caps.
   1. Flush valve: Sloan Royal #111-1.28TP; low consumption, 1.28 gallons per flush, 1-1/2-inch top spud, 1-inch screwdriver angle stop, vacuum breaker and trap primer, #VBF-72-A.
   2. Seat: Church #9500SSCT; elongated, solid plastic open front, less cover with heavy duty stainless steel hardware and check hinges, glass filled nylon nut with break-away nut.
   3. Mounting Height: Install in accordance with A.D.A. regulations.

B. Approved Manufacturers:
   1. Water closets:
      a. American Standard
      b. Kohler
      c. Zurn
      d. Sloan

2. Flush Valves:
    a. Sloan
    b. Zurn
    c. American Standard
3. Carriers:
    a. J.R. Smith
    b. Josam
    c. Mifab
    d. Wade
    e. Zurn
    f. Watts
4. Seats:
    a. Bemis
    b. Beneke
    c. Church
    d. Olsonite

2.2 LAVATORIES/WASH FOUNTAINS

A. Type P-2 (Handicapped): American Standard “LUCERNE” #0355.012; wall hung, vitreous china, 20”x18”, front overflow, concealed arms support, punched for centerset fitting with 4-inch centers.
    1. Faucet**:** Chicago #404-CP; two handle widespread lavatory faucet with 8-inch centers, chrome plated , No. E2805JKCP, 0.5 GPM aerator and lever handles.
    2. Strainer: McGuire #155-WC; chrome plated, cast brass grid strainer, 1-1/4-inch O.D. 17-gauge offset tailpiece.
    3. Supply: McGuire #2165LK; chrome plated wall flange, loose key angle stops, size 1/2-inch I.P.S. inlet with 3/8-inch O.D. outlet, 12-inch long flexible copper tube chrome plated risers.
    4. P-Trap: McGuire #8902; 1-1/4-inch x 1-1/2-inch x 17-gauge, chrome plated cast brass adjustable swivel P-tap with cleanout, slip joint inlet and tubular wall bend with shallow steel flange.
    5. Carrier: Wade #W520; single concealed arm lavatory carrier with non-slip locking device.
    6. Insulation: Insulate hot and cold water supply, tailpiece and P-trap with “Prowrap” anti-microbial, satin white, molded closed cell vinyl, seamless insulators, A.D.A. approved and as manufactured by McGuire Manufacturing, Inc.
    7. Mounting Height: Install in accordance with A.D.A. regulations.
    8. Mixing Valve: Powers #LM495; thermostatic, union ends, integral checks, ASSE 1070.

B. Approved Manufacturers:
    1. Lavatories:
        a. American Standard
        b. Kohler
        c. Zurn
        d. Sloan
    2. Faucets:
        a. Chicago
        b. Moen Commercial
        c. Symmons
        d. T&S
        e. Delta
        f. Powers
        g. HELVEX
        h. American Standard
    3. Carriers:
        a. J.R. Smith
        b. Josam

c. Mifab
d. Wade
e. Zurn
f. Watts

4. Supplies, Stops and Drain Fittings:
   a. McGuire
   b. Specified Trim
   c. Zurn
5. Insulation:
   a. McGuire-ProWrap
   b. Truebro
   c. Plumberex

2.3 ELECTRIC DRINKING FOUNTAINS

A. Type P-3 (Handicapped): Elkay #EMABFTL8WSSK; bi-level wall mounted barrier-free, no lead water cooler, non-filtered, stainless steel cabinet, sensor operated bottle filling station, stainless steel top with buffed satin finish, automatic stream regulator, Flexiguard safety bubbler, self-closing front push bar. All steel, brass, copper and aluminum major interior component construction with silver solder connections and #98324C apron. Water cooler design shall meet A.D.A. dual height requirements.
   1. Supply: McGuire #2165; chrome plated single, wall flange, wheel handle stops, 3/8-inch I.P.S. with 3/8-inch O.D., 12-inch long flexible riser, chrome plated.
   2. P-Trap: McGuire #8902; 1-1/4" x 1-1/2" x 17-gauge, chrome plated cast brass adjustable swivel P-trap with cleanout, slip joint inlet and tubular wall bend with shallow steel flange.
   3. Carrier: Wade #W-403; top and bottom hanger plate carrier, pipe uprights, block base feet.
   4. Mounting Height: Install in accordance with A.D.A. Regulations.

B. Approved Manufacturers:
   1. Drinking Fountains:
      a. Acorn
      b. Elkay
      c. Halsey Taylor
      d. Oasis
   2. Supplies and Stops:
      a. McGuire
      b. Specified Trim
      c. Zurn
   3. Carrier:
      a. Josam
      b. Mifab
      c. Smith
      d. Wade
      e. Zurn
      f. Watts

2.4 SERVICE SINKS

A. Type P-4: Stern-Williams #SBC-1700; "Corlow"; 24" x 24" x 12" corner model terrazzo mop service basin, with 20-gauge stainless steel cap, cast brass drain with stainless steel strainer and caulked connection to a 3-inch pipe.
   1. Faucet: Chicago #897; wall mount sink faucet with exposed, chrome plated brass valve body, renewable valves and seats with integral stops, vacuum breaker, lever handles, spout with pail hook, threaded hose end, top brace and 1/2-inch I.P.S. female inlets.

B. Approved Manufacturers:
   1. Terrazzo Sinks:
      a. Acorn
      b. Fiat
      c. Stern-Williams
   2. Faucets:
      a. Chicago
      b. Speakman
      c. T&S Brass
      d. Moen Commercial
      e. Delta
      f. Symmons

2.5 STAINLESS STEEL SINKS

A. Type P-5 (Handicapped): Elkay #LRAD-2521; single compartment, A.D.A. compliant 18-gauge, type 302 stainless steel, self-rimming, three hole punching 25" x 21" x 5-1/2" deep, 3-1/2-inch drain opening.
   1. Faucet: American Standard "Colony Soft" #4275.550.F15; two handle, spout with wrist blade handles and aerator; concealed mount, chrome plated brass faucet, ceramic disc cartridge, and 1.5 GPM or less flow restrictor. Faucet shall meet A.D.A. Requirements.
   2. Strainer: McGuire #1151AWC; A.D.A. compliant stainless steel basket strainer with offset tailpiece.
   3. Supply: McGuire #2165LK; chrome plated wall flange, loose key stops, size 1/2-inch I.P.S. inlet with 3/8-inch O.D. outlet, 12-inch long flexible copper tube chrome plated risers.
   4. P-Trap: McGuire #8912; 1-1/2" x 1-1/2" x 17-gauge, chrome plated, cast brass adjustable swivel P-trap with cleanout, slip joint inlet and tubular wall bend with shallow steel flange.
   5. Insulation: Insulate hot and cold water supply, offset sink strainer, tailpiece and P-trap with "Prowrap" anti-microbial, sating white, molded, closed cell vinyl, seamless insulators, A.D.A. approved and as manufactured by McGuire Manufacturing, Inc.
   6. Mixing Valve: Powers #LM495; thermostatic, union ends, integral checks, ASSE 1070.
   7. Disposer: Kitchen Aid #KCDB250, 1/2 H.P.

B. Type P-5A (Handicapped): Elkay #LRAD-2521; single compartment, A.D.A. compliant 18-gauge, type 302 stainless steel, self-rimming, three hole punching 25" x 21" x 6" deep, 3-1/2-inch drain opening.
   1. Faucet: American Standard "Colony Pro" #7077300; pull down faucet, 1.5 GPM, polished chrome..
   2. Strainer: McGuire #1151AWC; A.D.A. compliant stainless steel basket strainer with offset tailpiece.
   3. Supply: McGuire #2165LK; chrome plated wall flange, loose key stops, size 1/2-inch I.P.S. inlet with 3/8-inch O.D. outlet, 12-inch long flexible copper tube chrome plated risers.
   4. P-Trap: McGuire #8912; 1-1/2" x 1-1/2" x 17-gauge, chrome plated, cast brass adjustable swivel P-trap with cleanout, slip joint inlet and tubular wall bend with shallow steel flange.
   5. Insulation: Insulate hot and cold water supply, offset sink strainer, tailpiece and P-trap with "Prowrap" anti-microbial, sating white, molded, closed cell vinyl, seamless insulators, A.D.A. approved and as manufactured by McGuire Manufacturing, Inc.
   6. Mixing Valve: Powers, #LM495; thermostatic, union ends, integral checks, ASSE 1070.
   7. Disposer: Kitchen Aid #KCDB250, 1/2 H.P.

C. Type P-5B: Elkay #EWS2520W6C; single compartment, wall hung, 25" x 19.5" x 10-1/2", 14 gauge, 304 stainless steel complete with #LK940GN05T6H wrist blade faucet.
   1. Strainer: McGuire #151; brass sink strainer for 3-1/2-inch opening, 1-1/2-inch O.D. chrome plated tailpiece; 1-1/2-inch chrome plated continuous waste drain connection.
   2. Supply: McGuire #2165LK; chrome plated wall flange, loose key stops, size 1/2-inch I.P.S. with 3/8-inch O.D. outlet, 12-inch long flexible copper tube chrome plated risers.
   3. P-Trap: McGuire #8912; 1-1/2: x 1-1/2" x 17-gauge chrome plated, cast brass adjustable swivel P-trap with cleanout, slip joint inlet, and tubular wall bend with shallow steel flange.
   4. Mixing Valve: Powers #LM495; thermostatic, union ends, integral checks, ASSE 1070.

D. Approved Manufacturers:
   1. Sinks:
      a. Elkay
      b. Just
      c. Franke
      d. Kindred
   2. Faucets:
      a. Chicago
      b. Moen Commercial
      c. Speakman
      d. T&S Brass
      e. Delta
      f. HELVEX
      g. Symmons
   3. Supplies, Stops and Drain Fittings:
      a. McGuire
      b. Specified Trim
      c. Zurn
   4. Insulation:
      a. McGuire-Prowrap
      b. Truebro
   5. Mixing Valves
      a. Leonard
      b. Powers
      c. Watts
   6. Disposers
      a. Badger
      b. Kitchen Aid

2.6 SHOWERS

A. Type P-6: Powers #P910-H4; pressure-balancing mixing valve, adjustable stop screw to limit handle turn, integral service stops, 1.5 GPM, chrome plated showerhead with arm and flange, ASSE 1016.

B. Type P-6A (Handicapped): Powers #P910-H4-L-W-B; pressure-balancing mixing valve, adjustable stop screw to limit handle turn, wall/hand held shower with 5' flexible hose with in-line vacuum breaker, wall connection and flange, 30-inch slide bar for hand shower mounting, integral service stops and 1.5 GPM, ASSE 1016. Installation shall be compliance with A.D.A. regulations.

C. Approved Manufacturers:
   1. Bradley
   2. Chicago
   3. Powers
   4. Symmons
   5. Whitehall

6. Zurn
7. HELVEX

2.7 FLOOR DRAINS

A. Type P-7: Wade #W-1100-STD (Finished Area); cast iron drain with flange, integral reversible clamping collar, seepage openings, 6-inch diameter, satin nickel bronze strainer, 1/2" trap primer tap, vandal-proof screws.

B. Type P-7A: Wade #W-1100-FC-TPC; cast iron drain, with flange, integral clamping collar, 9” dia. nickel bronze strainer, 1/2" trap primer connection.

C. Type P-7B: Wade #W-1210-27 (Equipment Room); medium duty, cast iron drain, cast iron deep flange, non-tilting 12-inch ductile iron round grate, aluminum sediment bucket, 1/2" trap primer tap.

D. Type P-7C: Wade #W-9110-27-15-26 (Floor Sink); cast iron square floor sink, 8”x8” x6” deep with A.R.E. interior, aluminum dome strainer, nickel bronze half-grate aluminum sediment bucket, anchor flange with clamping collar.

E. Approved Manufacturers:
1. Cast Iron Drains
a. Mifab
b. Josam
c. J.R. Smith
d. Wade
e. Zurn

2.8 TRAP SEAL DEVICE

A. Rector Seal Sure Seal#97044 in-line, water-less trap seal device.

B. Approved Manufacturers:
1. Rector Seal
2. MIFAB

2.9 ROOF DRAINS

A. Type P-8: Wade #3000-AE-46-52-53 (Primary Roof Drain): lacquered cast iron body with sump, aluminum mushroom dome, flashing flange, underdeck clamp with integral gravel stop, bearing pan and adjustable extension.

B. Type P-8A: Wade #3000-AE-SD-46-52-53 (Overflow Roof Drain); lacquered cast iron body with sump, aluminum mushroom dome, flashing flange, underdeck clamp with integral gravel stop, bearing pan, adjustable plastic standpipe, and adjustable extension.

C. Downspout Nozzle: Wade #3940; cast bronze, threaded outlet and wall flange.

D. Approved Manufacturers:
1. Josam
2. J.R. Smith
3. Mifab
4. Wade
5. Zurn

2.10 APPLIANCE CONNECTIONS

A. Type P-9: Guy Gray Model T-200 20-gauge, white powder coated steel washing machine supply and drain connection box. 2-inch threaded drain, two 1/2-inch MPT brass combination bottom supply valves.

B. Type P-9A: Oatey #38934, polystyrene plastic washing machine supply and drain connection box. 2-inch drain, two 1/2-inch MPT brass combination bottom supply valves.

C. Approved Manufacturers:
   1. Guy Gray
   2. I.P.S. Corp.
   3. Oatey

2.11 SECURITY FIXTURES:

A. Type P-10: Acorn "PENAL-WARE" #1418FA Series; lavatory toilet combination fixture with front access, 14 ga., Type 304 Stainless Steel. Wall Type: 8" concrete block. Provide fixture with the following options:
   1. Base Model: 1418FA, 18" Lav-toilet combination, front access.
   2. Toilet Orientation: -CT, centered toilet.
   3. Fixture Mounting and Waste: -2, on-floor, wall-outlet.
   4. Bubbler: -BP, Bubbler-Penal.
   5. Valve Selection: -03-M, Pneumatic, single temp, metering.
   6. Valve Option: -PBH, hemispherical pushbutton.
   7. Flush Valve GPF: -1.28 GPF (HET).
   8. Flush Valve: -FVH, flush valve hydraulic.
   9. Cabinet Option: -PH-RF, paper holder, right front.
   10. Lavatory Waste Option: -OF, lavatory overflow.
   11. Toilet Options: -HPS, high polish seat.
   12. Product Options: -SW, wall sleeve.

B. Type P-10A: Acorn "Secure-Care" LR1449 Series; ADA compliant lavatory toilet combination fixture with front access, 14 ga., 304 stainless steel. Wall Type: 8" concrete block. Provide fixture with the following options:
   1. Base Model: LR1449, 49" Lav-toilet combination.
   2. Toilet Orientation: -LO, left offset.
   3. Fixture Mounting and Waste: -2, On-floor, wall outlet.
   4. Valve Selection: -03-M, single temp, metering.
   5. Flush Valve GPF's: -1.28 GPF (HET).
   6. Flush Valve: -FVH, Flush valve, hydraulic.
   7. Cabinet Options: -PH, paper holder.
   8. Toilet Options: -HPS, high polish seat.
   9. Product Options: -SW, wall sleeve.

C. Type P-10B: Acorn "MERIDIAN" 3701 Series; stainless steel curved front, uni-basin, ADA compliant. Provide fixture with the following options:
   1. Base Model: 3701.
   2. Fixture Mounting and Waste: -1, off-floor, wall outlet.
   3. Operations:
      a. -CSG, 4: centerset faucet with gooseneck spout and wristblade handles.
      b. -RLD, drop-in D-shaped basin.
      c. -H34, three holes, 4" centerset.
   4. Product Options:
      a. -SSN, 2-1/2" stainless steel narrow apron.

D. Type P-10C: Acorn “LUMALOY” #8104-SSLF; hose bibb; cast aluminum door and frame with prime coat finish, vacuum breaker, recessed cam latch, 3/4" connection.

E. Type P-10D: Acorn “PENAL-WARE” 1699 Series; detox toilet with remote flush valve, 14 gauge, Type 304 stainless stee. Wall type: 8” concrete block. Provide fixture with the following options:
   1. Base Model: 1699 detox toilet with flange.
   2. Supply: -W, Wall (concealed).
   3. Flush Valve GPF’s: -1.6
   4. Flush Valve Option:
      a. -FVH flush valve, hydraulic
      b. Flush Valve access panel #2898.

F. Approved Manufacturers:
   1. Acorn.
   2. Willoughby.

2.12 EMERGENCY FIXTURES

A. Type P-11 (Hanidcapped): Guardian #GBF-1721; barrier free; wall mounted eyewash with stainless steel wrap around skirt, four eyewash heads, mounting bracket, stay open brass ball valve, push flag, emergency sign, 1-1/2-inch P-trap, 1/2-inch I.P.S. supply. Install in accordance with A.D.A. regulations.

B. Type P-11A: Guardian #GFR3310; freeze-proof, polyethylene foam insulation with orange ABS jacket, electric heat tracing, 10” dia. Orange ABS shower head, spray head assembly with dust covers, schedule 40 galvanized pipe and fittings.

C. Approved Manufacturers:
   1. Acorn
   2. Bradley
   3. Guardian
   4. Haws
   5. Speakman

2.13 CONNECTIONS FOR OTHERS

A. The Contractor shall rough-in for and make all gas, water, and waste connections to all fixtures, equipment, appliances, etc., to be furnished in the building by the Owner or under any other Section of the Specifications or as indicated on the drawings.

PART 3– EXECUTION

3.1 EXAMINATION

A. Check millwork shop drawings. Confirm location, size of fixtures and opening before rough-in and installation.

B. Mounting heights of all fixtures shall be verified with architectural drawings prior to roughing in.

3.2 INSTALLATION

A. Anchor piping securely in wall or wall space to prevent damage when supply nipples are installed or removed and to prevent vandalism to exposed piping and flush valves.

B. Secure floor outlet fixtures to floor with brass floor flange caulked to soil or waste pipe. Seal joint with beeswax gasket. Do not use putty.

C. Secure floor mounted fixtures to floor with brass bolts and expansion anchors.

D. Stub all piping symmetrically with fixtures and at correct and uniform height.

E. Seal around all fixtures with white silicone flexible grout.

F. Flush valves on handicap accessible fixtures shall be installed with handle on the wide side of the toilet stall.

G. Lavatories shall have the mixed water temperature set at 110 degrees F.

H. Security Fixtures:
   1. The Contractor shall coordinate the fixture installation with the manufacturer.
   2. The Contractor shall provide all required accessories, components, mounting hardware, and fasteners as required for a complete and operating fixture, including ADA compliance where noted on the drawings.

END OF SECTION

SECTION 230500 - BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. The requirements set out in Bidders Documents, Contract Forms, General Conditions, Supplementary General Conditions and Special Conditions apply to all work specified in the sections of this Division.

B. While these specifications may be arranged in sections which describe work associated with particular trades or sub-contracts, such sections are not intended to describe all the work of any particular trade or sub-contract. Work required of a particular trade or sub-contract may also appear in other sections of the Specifications, and any given section may describe work of several different trades or sub-contracts. The particular sub-division of work between the Contractor and his sub-contractors shall be resolved by those parties, and not necessarily limited nor defined by any particular section of the Specification. The Contractor for the project shall be responsible for all work, regardless of which trade or sub-contract may actually perform the work. The reference to “Contractor”, as used herein, refers to the single, prime, Contractor for the total project, who will enter into an Agreement with the Owner for the total performance of the work.

C. Work covered by the Mechanical Sections of these Specifications shall include the furnishings of all materials, labor, taxes, transportation, safe working conditions, tools, permits, fees, inspections, utilities and incidentals necessary for the complete and operable installation of all mechanical systems.

D. Under these Contract Documents, the Contractor shall provide an installation that is complete in every respect. It shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

E. The contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, and all details of the work and the working conditions and to verify all dimensions and elevations in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor’s site visit, the verification and coordination of all existing conditions, and the inclusion of all considerations related to the existing conditions.

F. The responsibility for the furnishing of the proper equipment and/or material and the responsibility for seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor. The Contractor shall consult and request advice and supervisory assistance from the representative of the specific manufacturer for proper installation, operation, and startup. The manufacturers’ published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment. The contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract documents and the manufacturers’ directions and shall obtain the Architect’s instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer’s directions or such instructions from the Architect, he shall bear all resulting costs that may arise from any system or equipment deficiencies.

1.2 DRAWINGS AND SPECIFICATIONS

A. These Specifications are accompanied by Drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, light fixtures, etc. Items specifically mentioned in the Specifications but not shown on the Drawings and items shown on the Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were indicated by both.

B. If departures from the Drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance of the Architect.

C. The interrelation of the Specifications, the Drawings, and the schedules is generally as follows: The Specifications determine the nature and setting of the several materials, the Drawings establish the quantities, dimensions, and details, and the schedules give the performance characteristics.

D. Should the Drawings disagree in themselves or with the Specifications or with the various codes and regulations, the better quality or greater quantity of work or materials shall be assumed and estimated, and unless otherwise directed by the Architect in writing, shall be performed or furnished. In case the Specifications should not fully agree with the schedules, the latter shall govern. Figures indicated on Drawings govern scale measurements and larger scale details govern small scale Drawings.

1.3 SUBMITTALS

A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of Work. Three weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data. After the Contract is awarded, the Contractor will advise the Engineer in writing of the schedule for submission of shop drawings and product data and the persons authorized to sign submittal data on behalf of the Company.

B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

C. Before submission of Shop Drawings and Brochures, the Contractor shall certify that each Shop Drawings and each item of material or equipment complies with the Contract Documents for this Project. Such certification shall be made by the Owner, a Partner, a Corporate Officer of the Contractor, or by a person duly authorized to sign for the Contractor. Unless so certified, Shop Drawings and/or Brochures will be returned for resubmittal. Certifications shall be in the form of rubber stamp impressions or typed letter which states:

> I hereby certify that this Shop Drawing and/or brochure and the equipment and material shown on this Shop Drawing and/or Brochure complies in all respects (except as noted*) with the requirements of the Contract Documents for this

Project. I further certify that all data shown herein as to performance, dimensions, construction, materials, and other pertinent items are true and correct.

___(Name Of Contractor)_____

Signed _____

Position _____

Date _____

* Refer to exception requirements herein.

D. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: Title of the Sheet or Brochure; name and location of the building; names of the Architect, Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:
   1. Shop Drawings: Drawings shall be newly prepared and not reproduced from the Contract documents, drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by a draftsman skilled in this type of work. All ductwork, equipment layouts and similar Shop Drawings shall be drawn to at least 1/4" = 1'-0" scale.
   2. All Shop Drawings shall indicate the equipment actually purchased and the exact routing for all lines such as piping, conduit and ductwork. The elevation, location, support point, load imposed on the structure at support and anchor points, and size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All Design Drawing space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, etc., unless proper written authorization is received from the Architect to change them. All associated equipment, ductwork, piping, and conduit shall be coordinated and clearly shown on the Shop Drawings.
   3. Brochures: Brochures submitted to the Engineer shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space.
   4. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.

E. The submittal format shall follow the Specifications format with a submittal required for each section of Division 23. The submittal shall be contained in a three-ring hard back binder. Copies of each submittal shall be three-hole punched and arranged (or folded if required) for the Engineer's filing convenience. Provide one copy of updated TABLE OF CONTENTS and progressive-tabbed index sheets also for the Engineer's filing convenience. The submittal shall be indexed by specifications section.

F. Submittal data for each section must be complete. Partial submittals will not be reviewed. To the greatest extent possible all sections shall be submitted with the first submission. No more than three additional submissions will be allowed to complete the submittal package.

G. Unless a greater number is indicated within Division One of these specifications, submit six (6) copies of all Brochures for review. Submit one (1) reproducible and one (1) blueprint of shop drawings for review. Comments will be made on the reproducible to facilitate copying.

H. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Architect reserves the right to require the Contractor to furnish items exactly as described in the Contract Documents.

I. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they do not meet the specifications. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contactor is not able to furnish an acceptable alternate until the proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Architect and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Owner based on the particular circumstances.

1.4 DIGITAL (AUTOCAD) DRAWING FILES

A. If desired by the Contractor, a sub-contractor or product supplier for use in preparing shop drawings, installation drawings, as-built drawings or other project related documentation, AutoCAD drawing files may be obtained from MS2 Inc.

1.5 RECORD DRAWINGS

A. The contractor shall keep a set of Drawings on the job, noting daily all changes made in these Drawings in connection with the final installation, including exact dimensioned locations of all new and uncovered existing active and inactive utilities outside the building, and shall turn over a clean, neatly marked set of Drawings showing “as-installed” work to the Architect/Engineer for delivery to the Owner. All underground utilities, services, and systems shall be accurately located by the Contractor and dimensioned on the “as-installed” Drawings.

1.6 SPACE LIMITATIONS

A. Equipment has been chosen which will fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the Code requirements and the requirements of the local inspection department.

B. In the preparation of Drawings, a reasonable effort to accommodate approved Equipment Manufacturers’ space requirements has been made. However, since space requirements and equipment arrangement vary according to each Manufacturer, the responsibility for initial access and proper fit rest with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to Architect’s review:

1.7 OPERATING AND MAINTENANCE MANUAL

A. Prepare and submit to the Architect for delivery to the Owner two sets of an indexed manual with complete technical data for every piece of equipment and material installed under this Contract.
   1. Complete mechanical submittals that were approved for the project.
   2. Manufacturer’s installation instruction brochures.

3. Manufacturer's local representative and/or distributor's name and address.
4. Manufacturer's operating and maintenance brochures.
5. Manufacturer's internal wiring diagrams.
6. Contractor's installation wiring diagrams.
7. Replacement part number listings and/or descriptions including prices and source of supply.
8. Lubrication materials required, with instructions.
9. As-Built Drawings.
10. All warranties and guarantees.
11. Testing and Balancing Report.
12. Commissioning Report.

B. These manuals shall include all of the listed data bound into a permanent hard-back binder identified on the cover as "Operating and Maintenance Manual". Provide a title page listing the name and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Trade-Contractors installing equipment represented in the brochure.

C. Contents of the manual shall be grouped in sections according to the various sections of Division 23, and shall be listed in a Table of Contents:
1. 23 09 23 - Direct Digital Control System
2. 23 34 00 – Fans
3. 23 52 33 - Packaged Water Tube Boilers
4. 23 62 13 - Air Cooled Condensing Units
5. 23 74 00 - Packaged Rooftop Air Conditioning Units
6. 23 74 13 - Air Handling Units
7. 23 74 13 - Air Handling Units – 5 Tons and Below
8. 23 74 23 - Make-Up Air Unit
9. 23 81 26 - Ductless Split System
10. 23 81 29 - Variable Refrigerant Volume (VRV) HVAC System
11. 23 82 19 - Fan Coil Units
12. 23 82 20 - Unit Ventilators
13. 23 82 39 - Electric Heaters
14. 23 90 00 - Testing, Adjusting and Balancing

1.8 QUALITY ASSURANCE

A. The Contractor shall comply with all applicable city, county, state, or federal rules, codes and ordinances.

B. None of the terms or provisions of this Specification shall be construed as waiving any rules, regulations, or requirements of these authorities.

C. A competent foreman or superintendent, initially approved by the Architect, shall be kept by the Contractor at the building to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Architect. Architect's and/or Owner's representatives shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the Architect's representative. Recommendations made shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced at once, to the satisfaction of the Architect.

D. It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

E. The Mechanical Drawings are diagrammatic in character and cannot show every connection in detail or every pipe and duct in its exact location. These details are subject to the requirements of codes, ordinances and also electrical, structural and architectural conditions. The Contractor shall carefully investigate all electrical, structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases or above suspended ceilings, etc., in finished portions of the building, unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers hall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise note.

F. The approximate location of each item is indicated on the Drawings. These Drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the approval of the Architect. The Architect and Engineer reserves the right to make reasonable changes in the locations indicated without additional cost.

1.9 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided protect equipment from rust, weather, humidity, dust, or physical damage.

1.10 UTILITIES

A. The Contract Documents reflect the general location, size, and elevations of sewer lines; location, size and pressure of water and other lines; and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local utility companies in order to coordinate and confirm the exact requirements for each utility to provide a complete and operative system. The bid submitted by the Contractor shall include costs for all such coordinative work, as well as any and all utility company charges and/or fees.

1.11 TEMPORARY SERVICES

A. It shall be the responsibility of the Contractor to provide a temporary system for each utility that is required during construction with all such temporary utility costs being billed to the Contractor.

1.12 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of twelve (12) months after the final acceptance of work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The specifications contain the names of manufacturers which are considered acceptable based on the quality of the product.

B. Where acceptable manufacturers are listed, only products of those manufacturers may be provided. Additionally, the product must meet all the detailed requirements of the specifications.

C. If no manufacturer's name is mentioned, the Contractor shall provide equipment and material which meet the specifications.

D. The drawings represent the manufacturer's equipment scheduled. The listing of acceptable manufacturers in the specifications is not intended to imply that equipment of these other manufacturers will fit in the space provided or have the same electrical, structural or other requirements as the equipment scheduled. The Contractor must insure that the equipment provided will meet all project requirements prior to submitting data on the equipment.

2.2 MATERIALS AND EQUIPMENT

A. All materials shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been treated in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

B. Materials and equipment shall be new and shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these Specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years prior to bid opening. Where custom or special items are required, these shall be fully described using Drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

C. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

D. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions. Where approved equipment requires electrical power other than those used for design purposes, the Contractor shall be responsible to adjust protective devices, starter sizes, conductors, conduits, etc. to accommodate this approved device electrically.

E. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the items of equipment. All data on nameplates shall be legible at the time of final inspection.

F. Equipment vibration shall not exceed the following criteria:

Equipment	Maximum Allowable Vibration Peak to Peak Displacement (MIL)
Pumps	
1800 RPM	2
3600 RPM	1
Centrifugal Compressors	1
Screw Compressors	1
Fans (Centrifugal and Axial)	
Under 600 RPM	4
600 RPM to 1000 RPM	3
1000 RPM to 2000 RPM	2
Over 2000 RPM	1

G. All pipe, fittings, appurtenances, and other material required for complete installation of these systems shall be new to conform to manufacturer's recommendations, unless otherwise specified. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of final completion, shall be replaced by this Contractor without extra cost to the Owner. Scratched equipment shall be repainted with factory paint to match existing or cold galvanized as required.

2.3 PROJECT WINDSTORM REQUIREMENTS

A. This project is located within a windstorm area and requires the special attention associated with windstorm zones.

B. The contractor is responsible for providing construction services as needed to satisfy the requirements of the construction drawings and specifications, the referenced building code and the Texas Department of Insurance Windstorm Inspection Program. All the construction administration cost associated with the submittal preparation, submittal review, inspection coordination, including all general conditions, overhead and profit, shall be included in the contractor bid.

C. For the new exterior mechanical equipment, exposed exterior ductwork and exposed exterior piping, the engineering design for these assemblies, including their support components (curbs, stands, sleepers, etc.) and anchoring of these items to the structure shall be a delegated design, performed by the equipment, ductwork and piping manufacturer. Hence, this responsibility falls on the general contractor, their subcontractors, and their vendors. Neither the mechanical engineer or windstorm inspector is responsible for designing the rooftop equipment assemblies, ductwork/piping assemblies nor the anchoring of these assemblies to the structure. Submittals of the engineered assemblies need to be provided by the contractor for review and for use in field inspections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install unions or flanges at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of system. No union or flange will be required in welded lines or lines assembled with solder joint fittings, except at flanged valve or union connected equipment items, machinery items, and other special pieces of apparatus. Unions in 2 inches and smaller ferrous lines shall be 300 lbs. AAR, malleable iron unions with iron to brass seats, and 2-1/2 inches and larger shall be ground flange unions. Unions in copper lines shall be 125 lbs. ground joint brass union, or 150 lbs. brass flanges, if required by the matching item of equipment. Companion flanges on lines at various items of equipment, machines and pieces of apparatus, shall serve as unions to permit removal of the particular items. Unions or flanged devices connecting ferrous pipe to copper or brass pipe shall be dielectric type.

B. All equipment shall be installed in a manner to permit access to parts requiring service without disassembly of piping mains and other equipment. Access panels or doors shall be coordinated with the Architect and provided where necessary to permit valve equipment service or removal.

C. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly and completely protected against damage.

D. This Contract includes many different systems furnished and installed by different trades. Each trade shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping any other trades. Where space requirements conflict, the following order of precedence shall, in general be observed:
   1. Building lines.
   2. Structural members.
   3. Soil and drain piping.
   4. Vent piping.
   5. Refrigerant piping.
   6. Condensate piping.
   7. Electrical bus duct.
   8. Supply ductwork.
   9. Exhaust, return, and outside air ductwork.
   10. Fire sprinkler piping.
   11. Circulating water piping.
   12. Domestic hot and cold water piping.
   13. Natural gas piping.
   14. Electrical conduit.

3.2 EXCAVATION AND BACKFILL

A. The Contractor shall perform all excavation of every description required in the execution of his work. Excavation shall be through whatever substance encountered, to the depths indicated on the Drawings, or as required. Excavated material suitable for backfill shall be piled in an orderly manner a sufficient distance from the trench to prevent overloading sides and cave-ins. Excavated materials not suitable for backfill shall be removed from the site or stored as directed. Grading shall be done to protect the excavation from surface water. Trenches shall be maintained in a dry condition by bailing, pumping, or other approved methods. Pipe shall not be laid in wet trenches.

B. Sheeting and shoring shall be provided as required for the protection of the work and the safety of personnel. All excavations in excess of five (5) feet shall be in accordance with OSHA requirements relating to trench safety systems. Contractor shall certify that all trench safety systems will be in accordance with OSHA requirements. Certifications of trench safety systems shall be filed with the authority having jurisdiction.

C. Trenches shall be of the necessary width and depth to provide for proper laying of pipe and appurtenances, with banks as nearly vertical as possible. Bottoms of trenches shall be excavated to the grade and depth indicated or required, and barrel of pipe shall be laid on a minimum 12-inch sand bed. Bell holes, of a size to permit proper make-up of grading, shall be provided as required. Existing underground piping shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired to the Architect's satisfaction, at the Contractor's expense. Provide 3,000 pound concrete of 3 inches minimum enclosure around lines that cross electrical utility lines or telephone cables.

D. Trenches shall not be backfilled until all required test have been performed. This requirement does not preclude sectional testing and backfilling of the various systems. Trenches shall be carefully backfilled with approved sand, free from large earth clods, rocks, and/or foreign materials, laid in 6-inch layers, moistened thoroughly, and carefully rammed to an elevation of one foot above top of pipe. The remainder of the backfill to finish grade shall be placed in one foot layers soaked with water, and well tamped. Under roadways, backfill to bottom of road bed material with sand only. Where settlement occurs, trenches shall be re-opened to depth required for proper compaction, refilled, and compacted.

E. Open trenches abutting foundation or basement excavations, building walls, and grade beams, will not be permitted, but shall be backfilled and completed, for a distance of not less than 10' from the above features, as soon as possible. All damage resulting from flooding or other stresses due to open trenches shall be paid for by the Contractor.

F. Where excavation requires, existing walks, street, drives, or other existing pavement to be cut to install new lines and to make new connections to existing lines, the size of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new materials is completed and the excavation has been backfilled, the paving shall be patched, using materials to match those cut out. The patches shall be thoroughly bound with the original surfaces, and shall be level with them.

3.3 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to permit installation of any work under this section of the Specifications or to repair any defects that may appear, up to the expiration of the guarantee period, such cutting shall be done under the supervision of the Architect by the Contractor. The Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

B. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades occasioned by cutting operations, or occasioned by the failure of any par to work installed under this Contract, shall be performed by the trade whose work is involved, but shall be paid for by the Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.

3.4 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide his own hoisting facilities and scaffolding to set his materials and equipment in place, as indicated on Drawings and for subsequent cleaning, testing, and adjusting.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to the job, in accordance with intent of the documents.

3.5 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the project site.

B. The Contractor shall protect all equipment, ductwork, and piping during construction against entry of dust, debris, trash, etc. Openings into equipment, ductwork, and piping shall be covered until final connections are made. Prior to making final connections, clean both inside and outside of equipment, ductwork, and piping. Prior to initial start-up of air-handling units, fan coil units, or fan-powered terminal units, install air filters. After all drywall work is completed, replace all air filters. Finally, replace all air filters again when the Owner takes possession.

C. At completion of the job, the Contractor shall remove all of his tools, scaffolding, and surplus materials. He shall leave the area “broom clean”.

3.6 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Unless specifically shown, indicated, or specified to the contrary, each item shown or required by the Mechanical Drawings or specified in the Mechanical Specifications shall be accompanied by all motors and starting and controlling equipment necessary for the items proper operations. These motors shall be integrally attached to and/or installed with their associated equipment item and electrically connected as specified in Division 26 – Electrical. Equipment controlled from motor control centers shall be supplied with motors only. Motor control centers are specified in Division 26 and shown on the Electrical Drawings.

END OF SECTION

SECTION 230529 - SUPPORTS AND ANCHORS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Inserts and Rods.

B. Pipe Hangers and Supports.

C. Duct Hangers and Supports.

D. Flashing for Mechanical Piping, Ductwork and Equipment.

E. Pipe and Duct Penetration Sleeving and Sealing for All Services.

1.2 SUBMITTALS

A. Submit shop drawings on proposed methods and materials including hangers, hanger attachments, wall supports, trapeze supports, floor supports, HVAC unit suspension, submit details of pipe and duct penetrations, sleeves, sealing and UL approved fire stop assemblies.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacturer's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specification Section 230500 for additional requirements.

A. Anvil.

B. B-Line.

C. Erico.

D. Tolco.

E. Unistrut.

2.2 INSERTS AND RODS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Where concrete slabs form finished ceiling, finished inserts, flush with slab surface.

C. Provide electrogalvanized steel hanger rods, threaded both ends, threaded one end or continuous threaded.

D. Size inserts to suit threaded hanger rods.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers: Pipe sizes 1/2 inches to 12 inches; adjustable galvanized steel clevis. Anvil No. 260.

B. Hangers: Pipe sized 6 inches and over; adjustable galvanized steel yoke. Anvil No. 181.

C. Multiple or Trapeze Hangers: Steel channels with hanger rods.

D. Wall Support: Pipe sizes to 3 inches; welded galvanized steel bracket. Anvil No. 194.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded galvanized steel bracket. Anvil No. 195

F. Vertical Support: Galvanized Steel riser clamp. Anvil No. 261.

G. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange.

H. Floor Support for Hot Pipe Sizes to 6 inches and Over: Adjustable cast iron roll and stand.

I. Expansion Anchors: Phillips Red Head or HILTI.

J. Steel Beam Clamps: Anvil No. 92, 93, 94.

K. Design hangers to impede disengagement by movement of supported pipe.

L. Provide copper plated hangers and supports, or two layers of PVC tape, where hangers and supports are in direct contact with the copper pipe.

2.4 DUCT HANGERS AND SUPPORTS

A. Comply with SMACNA Standards Section 4.

2.5 FLASHING

A. Steel Flashing: 26-gauge galvanized steel.

B. Lead flashing: 5 lb./sq. ft. sheet lead for water-proofing, one lb./sq. ft. sheet lead to soundproofing.

C. Safes: 5 lb./sq. ft. sheet lead or 8 mil thick neoprene.

D. Caps: Steel, 22-gauge minimum, 16-gauge at fire resistant structures.

2.6 SLEEVES AND SEALANTS

A. Piping Through Masonry or Concrete Walls, Concrete Footings and Beams and Concrete Floor: Schedule 40 galvanized steel pipe.

B. Piping Through Fire Rated Walls: 18-gauge galvanized sheet metal. Seal with UL approved fire stop assembly utilizing an intumescent foam sealant.

C. Ducts Through Fire Rated Walls or Floors: 18-gauge galvanized sheet metal. Seal with UL rated fire stop assembly utilizing an intumescent foam sealant.

D. Pipes Penetrations Below Grade: “Link Seal” penetration seal with Century galvanized after fabrication steel sleeve set in place prior to concrete placement.

E. Plastic cast-in-place firestop device, UL and FM approved, integrated moisture and smoke seal. Provide with height extension kits, metal deck adapters, water barriers or top seal plugs where required. Hilti #CP-680-P.

PART 3 - EXECUTION

3.1 INSERTS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inches or ducts over 60 inches wide.

C. Where concrete slabs form finished ceiling, finish inserts, flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. All structures and appurtenances employed for the purpose of supporting the pipe and guiding it properly shall be carefully fabricated in such a manner as to preserve the true grade of the pipe without subjecting either the pipe or the supporting and guidance members to any undue strain.

B. Support horizontal piping and provide hangers and rods at each change in direction. Spacing shall comply with Manufacturer’s Standardization Society (MSS) Standard Practice SP-69 or as required by the Mechanical Code. In cases of conflict between the specifications and this Standard, the most stringent requirements shall govern. Refer to hanger spacing table below:

HANGER SPACING TABLE

Hanger Spacing, ft.				
NPS, In.	Standard Steel Pipe		Copper Tube	Rod Size, In.
	Water	Steam	Water	
1/2	7	8	5	1/4
3/4	7	9	5	1/4
1	7	9	6	1/4
1-1/2	9	12	8	3/8
2	10	13	8	3/8
2-1/2	11	14	9	3/8
3	12	15	10	3/8
4	14	17	12	1/2
6	17	21	14	1/2
8	19	24	16	5/8

10	20	26	18	3/4
12	23	30	19	7/8
14	25	32		1
16	27	35		1
18	28	37		1-1/4
20	30	39		1-1/4
Source: MSS Standard SP-69				

C. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.

D. Place a hanger within one foot of each horizontal elbow.

E. Use hangers which are vertically adjustable 1-1/2 inches minimum after piping is erected.

F. Support piping at each change of direction, at ends of branches, at base and top of riser pipes and drops, and wherever necessary to prevent sag, bending or vibration, in addition to above-listed hanger spacing.

G. Support vertical piping at every floor. Support vertical soil pipe at each floor at hub.

H. Pipe hangers on insulated lines shall be sized to fit the outside of the insulation.

I. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers, designed to support loads per ANSI B31.1.

J. Where practical, support riser piping independently of connected horizontal piping.

K. Hangers shall be anchored to the side of existing concrete joists or beams. Drilling and anchoring threaded rod to the underside of existing concrete slabs is prohibited.

L. Piping installed on trapeze hangers shall be completely insulated and not anchored directly to the trapeze rack. Pipe straps shall be sized to fit over the insulated piping.

3.3 HANGERS AND SUPPORTS FOR DUCTWORK

A. Comply with SMACNA Standards Section 4.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Except as otherwise specified or indicated on the drawings, provide for major equipment minimum four inches thick, 6 X 6 – 10/10 mesh reinforced concrete house-keeping bases poured directly on structural floor slab pinned in place and extended 6 inches minimum beyond machinery bedplates. Provide 45 degrees by one inch bevel of top surface edge along concrete base. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment. Coordinate with other trades.

B. Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

C. Grout all bases of base mounted pumps in solid to concrete pad with non-shrink epoxy grout.

3.5 PRIMING

A. Prime coat non-galvanized or non-plated steel hangers, reinforcements and supports.

3.6 FLASHING

A. Flash and counterflash where mechanical equipment passes through weather or waterproofed wall, floor, and roofs.

B. Flash vent and soil pipes projecting 12 inches minimum above finished roof surface with lead worked 1-inch minimum into hub, 8 inches minimum clear on sides with minimum 24” x 24” sheet size. For pipes through outside walls, turn flange back into wall and caulk.

C. Provide curbs for mechanical roof installation 12 inches minimum high. Flash and counterflash with steel, soldered and waterproofed.

3.7 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through floors 2 inches above finished floor. Caulk sleeves full depth.

C. Sleeves through walls shall be flush with the finished wall surface.

D. Size sleeves large enough to allow for movement due to expansion, to allow insulation to extend through the sleeve uninterrupted and to allow space for proper sealing.

E. Install fire stop assemblies in strict accordance with manufacturer’s printed installation instructions and provisions of UL rating.

F. Install chrome plated escutcheons where piping passes through finished surfaces.

G. Pipe and duct sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided for roof penetrations.

END OF SECTION

SECTION 230548 - MECHANICAL SOUND AND VIBRATION CONTROL

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Vibration Isolators.

B. Flexible Connectors.

C. Sound Attenuating Units.

1.2 SUBMITTALS

A. Submit manufacturer's data for all vibration isolation components including.
   1. Dimensional data.
   2. Materials.
   3. Details of construction.
   4. Spring diameter.
   5. Spring free height.
   6. Maximum load.
   7. Rated deflection.

B. For each item of equipment describe the isolation system to be provided including:
   1. Bases.
   2. Isolators.
   3. Flexible connections.
   4. Loads for each isolator.
   5. Disturbing frequency of equipment.
   6. Natural frequency of isolators.
   7. Static deflection.
   8. Isolation system efficiency at operating speed.

C. For sound attenuators submit manufacturer's product data including:
   1. Dimensional data.
   2. Materials of construction.
   3. Details of construction.
   4. Pressure drop at design air flow.
   5. Sound attenuation in each octave band.

1.3 QUALITY ASSURANCE

A. A representative of the vibration isolation manufacturer shall inspect the completed project and testify in writing all vibration isolation devices and systems are installed according to manufacturer's installation instructions.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specifications Section 230500 for additional requirements.

A. Isolators and Flexible Connectors:
   1. Amber-Booth.
   2. Consolidated Kinetics.
   3. Flexhose.
   4. Keflex.
   5. Korfund.
   6. Mason Industries.
   7. Metraflex.
   8. Vibration Mountings and Controls, Inc.
   9. Vimco.
   10. Vibration Eliminator Co.

B. Sound Attenuators:
   1. Commercial Acoustics.
   2. Industrial Acoustics.
   3. Rink.
   4. Spiral Pipe of Texas.
   5. VibroAcoustics

2.2 ISOLATION TYPES

A. Type MH-1 Mountings
   1. Neoprene mountings shall have a minimum static deflection of 0.35" (9mm). All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the Overhang.

B. Type MH-2 Mountings
   1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cap or 1/4" (6mm) neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.

C. Type MH-3 Mountings
   1. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on spring mountings, as described in Engineering Specification B, including the neoprene acoustical pad within a rigid sided housing that includes vertical limit stops to prevent spring extensions when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed, without changing the installed and operating heights. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as horizontal modes. The hole through the bushing shall be a minimum of 0.75" (20mm) larger in diameter than the restraining bolt. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 0.5" (12mm) to avoid bumping and interfering with the spring action. Vertical limit stops shall be out of contact during normal operation.

Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting. Housings and springs shall be powder coated and hardware electro-galvanized.

D. Type MH-2 Hangers
   1. Vibration hangers shall contain a steel spring and 0.2" (6mm) deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

E. Type MH-4 Horizontal Thrust Restraints
   1. When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints. The restraint shall consist of a modified Specification B spring mounting. Restraint springs shall have the same deflection as the isolator springs. The assembly shall be preset at the factory and fine tuned in the field to allow for a maximum of ¼" (6mm) movement from stop to maximum thrust. The assemblies shall be furnished with rod and angle brackets for attachments to both the equipment and duct work or the equipment and the structure. Restraints shall be attached at the center line of thrust and symmetrically on both sides of the unit.

F. Type IB-1 Bases
   1. Vibration isolator manufacturer shall furnish rectangular structural beam or channel concrete forms for floating foundations. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells.
   2. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. In general, bases shall be a minimum of 1/12th of the longest dimension of the base, but not less than 6". Forms shall include minimum concrete reinforcement consisting of 3/8" bars or angles welded in place on 6" centers running both ways in a layer 1½" above the bottom, or additional steel as is required by the structural conditions. Height saving brackets shall be employed in all mounting locations to maintain a 2" clearance below the base.

G. Type FC-1 for Following: Locations Within MER & Water Applications up to 180 Degrees
   1. Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement. Substitutions must have certifiable equal or superior characteristics. The raised face rubber flanges must encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable. Size 1½" (40mm) through 14" (350 mm) shall have a ductile iron external ring between the two spheres. Sizes 16" (400mm) through 24" (600mm) may be single sphere. Sizes ¾" (20mm) through 2" (50mm) may have one sphere, bolted threaded flange assemblies and cable retention.
   2. Minimum ratings through 14" (350mm) shall be 250psi at 170°F and 215psi at 250°F. (1.72MPa at 77°C and 1.48MPa at 121°C.) 16" (40mm) through 24" (600mm) 180psi at 170°F and 150psi at 250°F. (1.24MPa at 77°C and 1.03MPa at 121°C.) Higher published rated connectors may be used where required.
   3. Safety factors shall be a minimum of 3/1. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.
   4. The piping gap (distance between companion flanges) shall be equal to the length of the expansion joint under pressure. Control rods passing through ½" (12mm) thick Neoprene washer bushing large enough to take the thrust at 1,000psi (0.7 kg/mm2) of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies

on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.

H. Type FC-2 – (Steel Pipe) for Following: Locations Outside MER, Water Applications (over 180 degrees), Air and Steam

1. Flexible stainless steel connectors shall have 304 stainless steel hose and braid. Sizes 2½" and smaller may have threaded carbon steel male nipples or copper ends as required. Larger sizes are to be furnished with one floating and one fixed carbon steel flange. Groove ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Minimum lengths and minimum number of convolutions per foot to assure flexibility are as tabulated below. Short "Pump Connector" lengths are not acceptable.

Pipe or Tubing Size		Flanged Face to Face		Copper or Threaded Ends End to End		Grooved Ends End to End		Minimum Convolutions per	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(foot)	(meter)
1/2	15			12	300	12	300	108	354
3/4	20			12	300	12		94	308
1	25			12	300	12	300	84	276
1-1/4	30			12	300	12	300	74	243
1-1/2	40	12	300	12	300	12	300	70	230
2	50	12	300	12	300	12	300	68	223
2-1/2	65	12	300	18	450	18	450	56	184
3	75	12	300	18	450	18	450	54	177
4	100	18	450	24	600	24	600	32	105
5	125	18	450			24	600	30	98
6	150	18	450			24	600	29	95
8	175	18	450			24	600	26	85
10	200	24	450			28	700	25	82
12	250	24	450			30	750	24	82
14	200	24	450			28	700	25	82
16	200	24	450			28	700	25	82

2. Connectors shall be installed in equipment side of shut off valves.

PART 3- EXECUTION

3.1 VIBRATION ISOLATORS

A. Install all vibration isolation devices, sound attenuators, flexible connection in accordance with the manufacturer's printed installation instructions.

3.2 Horizontal Pipe Isolation

A. All piping connected to isolated equipment shall be isolated within the mechanical equipment room or for a distance of 50 feet from the equipment; whichever is greater. Isolators shall be type MH-2 as described above, with a minimum steel spring deflection of 0.75" (20mm). Hangers shall be as close to the overhead supports as practice

3.3 EQUIPMENT ISOLATION SCHEDULE

Equipment	Base Type	Flex Type	Type	Isolator Deflection
Chillers	---	FC-1	MH-3	1.50”
Boilers	---	FC-2	MH-3	0.75”
Pumps				
Closed Couple/ Based Mounted	IB-1	FC-1	MH-2	1.50”
Booster (House)	IB-1	FC-1	MH-2	1.50”
Condensate	IB-1	FC-1	MH-2	1.50”
Sand Filters Packaged	IB-1	FC-1	MH-2	1.50”
Centrifugal Separator Pkg.	IB-1	FC-1	MH-2	1.50”
AHU				
Indoors	---	FC-1/2	MH-2	1.50”
Rooftop (Curb Mounted)	RSC-1	FC-1	MH-2	2.50”
Heat Exchangers and Expansion Tanks	---	---	MH-2/3	0.75”
Air Compressors				
Tank Mounted	IB-1	FC-2	MH-2	1.50”
Rotary, Centrifugal, Screw	IB-1	FC-2	MH-2	1.50”
Vacuum Pump				
Rotary, Centrifugal, Screw	IB-1	FC-2	MH-2	1.50”
Fan Coil Units	---	FC-2	MH-2	0.75”
Fan Powered Boxes	---	FC-2	MH-2	0.75”
Fans				
In-line/Cabinet – Up to 5HP	---	---	MH-2	0.75”
In-line/Cabinet – Over 5HP	---	---	MH-2	1.50”
Tubular – Up to 5HP	---	---	MH-2	
Tubular – Over 5HP	IB-1	---	MH-2	
Vane Axial: Floor–Up to 5HP	IB-1	---	MH-2	
Vane Axial: Floor–Over 5HP	IB-1	---	MH-2	
Vane Axial: Ceiling–Up to 5HP	---	---	MH-2	
Vane Axial: Ceiling–Over 5HP	---	---	MH-2	
Fan Heads–Up to 5HP	IB-1	---	MH-2	
Fan Heads–Over 5HP	IB-1	---	MH-2	
Utility Sets: Indoor–Up to 5HP	---	---	MH-2	
Utility Sets: Indoor–Over 5HP	IB-1	---	MH-2	
Utility Sets: Outdoor – Up to 5HP	IB-1	---	MH-2	
Utility Sets: Outdoor – Over 5HP	---	---	MH-2	
Cooling Tower	Steel by Contractor	FC-1	MH-3	
Condensing Units/Condensers	---	FC-1/2	MH-3	

END OF SECTION

SECTION 230553 - MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pipe Identification.

B. Equipment Identification.

1.2 SUBMITTALS

A. Submit product data describing materials and methods of attachment for each type of identification device.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The product of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specifications Section 230500 for additional requirements.

A. Brady.

B. Seton.

C. Brimar

2.2 PIPE IDENTIFICATION

A. Pipe markers shall be suitable for all temperatures anticipated in system down periods as well as operational times.

B. Adhesive markers shall be made of vinyl cloth with extra strong adhesive (32 oz. per inch width) and shall have a silicone plastic overcoating. Surface preparation shall be as prescribed by the manufacturer. The adhesive marker shall be used on indoor applications only.

C. All plastic snap over type pipe identification shall be outdoor grade acrylic plastic. Strap on construction shall be used on pipe size (including insulation) six inches and over.

D. Each marker shall indicate direction of flow with an arrow pointing away from the marker. When flow can be in each direction the marker shall have double ended arrows.

E. The marker shall comply with ANSI A13.1 and ANSI Z53.1 for scheme and color codes.

F. Letter style shall be bold and easy to read, similar to Sans Serif Gothic bold.

2.3 EQUIPMENT IDENTIFICATION

A. Equipment identification tags shall identify the function and use of the equipment in language corresponding to the drawings and schedules.

B. Aluminum nameplates shall be minimum 2-1/2”x3/4” with black enamel background with etched or engraved natural aluminum lettering not less than 1/4-inch high.

C. Engraved laminated plastic nameplates may be used on indoor equipment minimum 2-1/2” x 3/4” with 1/4-inch high lettering and contrasting letter color.

PART 3– EXECUTION

3.1 INSTALLATION

A. All identification shall be located so that the view is unobstructed.

B. Attachment of all identification tags or plate shall be permanent, suitable for the location and located so as to not interfere with system operation or maintenance.

C. Equipment manufacturers nameplates or identification shall not be obscured.

3.2 PIPE AND DUCT IDENTIFICATIONS

A. Use a pipe marker at each valve to show proper identification of pipe contents. Where several valves exist on one header, it is necessary to mark only the header.

B. Apply a pipe marker and an arrow marker at every point of pipe entry or exit or where line goes through a wall.

C. Apply pipe markers and arrow markers at intervals not exceeding 25 feet.

D. Apply markers around circumference of pipe where view is unobstructed in open and service areas above ceiling.

E. Pipe and duct identification markers and arrow flow markers shall be provided on the following systems:
   1. Domestic Hot Water
   2. Domestic Hot Water Recirculating
   3. Domestic Cold Water
   4. Fire Protection
   5. Sanitary Sewer
   6. Refrigerant
   7. Natural Gas
   8. Roof Drain Piping
   9. Soft Water
   10. Supply Duct
   11. Return Air Duct
   12. General Exhaust Duct
   13. Smoke Exhaust
   14. Condensate

F. The legend shall be explicit in identifying the contents. Examples are shown below:

Examples of Legends

High Temp Water 400 degrees 250 psi
Air 100 psi
Foam

3.3 EQUIPMENT IDENTIFICATION

A. All pieces of major equipment shall be identified as to function and distinguished number.

B. Plates shall be attached with screws or rivets.

END OF SECTION

SECTION 230700 - MECHANICAL INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Piping, Equipment and Duct Insulation.

B. Non-combustible fire resistive grease duct wrap.

1.2 SUBMITTALS

A. Submit manufacturer's product data including:
   1. Schedule of materials by service showing thickness and finish.
   2. Thermal properties.
   3. Adhesives and sealants.
   4. Installation procedures.

1.3 QUALITY ASSURANCE

A. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness.

B. Perform work at temperatures recommended by the adhesive manufacturer.

C. Insulation shall be applied to clean dry surfaces. Piping shall be tested before insulation is applied or joints shall be left uncovered until leak test have been performed.

D. All insulation shall have composite fire and smoke hazard ratings (insulation, jacket and adhesive used to adhere jacket or facing to the insulation), as tested by procedure ASTM E-84, NFPA 255 and UL 73 not exceeding Flame Spread of 25, Fuel Contributed of 50 and Smoke Developed of 50. All other components such as adhesives, mastics (except joint sealer), cements, tapes and cloths, etc. shall also meet these ratings. ASTM-E84-25/50 rating should be clearly marked on each joint of insulation.

E. Insulated materials shall be formaldehyde-free.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacturer's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacturer's literature for the device scheduled.

Refer to specification Section 230500 for additional requirements.

A. Insulation:
   1. Knauf.
   2. Manson
   3. Johns-Manville

B. Fire Resistive Duct Wrap:
   1. FireMaster.
   2. Nelson.

C. Adhesives, Sealants and Finishes:
   1. Childers.
   2. Foster.
   3. 3M.

D. PVC Fitting Covers
   1. Proto.

E. Aluminum Jacketing
   1. ITW Insulation Systems.
   2. GLT Products.

2.2 MATERIALS

A. Mineral Wool Pipe Insulation: Pre-molded pipe covering with white all service vapor barrier jacket and pressure sensitive adhesive longitudinal lap seal, 0.23 K factor at 75 degrees F.

B. Mineral Wool Insulation Board: 3.0 pcf density, semi-rigid inorganic fiber board with FSK vapor barrier jacket, 0.23 K factor at 75 degree F, formaldehyde-free. Manufacturer: Knauf Earthwool.

C. Mineral Wool Blanket: 1.0 pcf density, glass fiber blanket with foil scrim Kraft vapor barrier jacket, 0.27 K factor at 75 degree F, formaldehyde-free. Manufacturer: Knauf Atmosphere Duct wrap.

D. Mineral Duct Liner: 1.5 PCF density, flexible mat-faced, inorganic glass fiber, formaldehyde-free. Manufacturer: Knauf Atmosphere Duct Liner.

E. Elastomeric Insulation: Flexible, closed cell elastomeric thermal insulation with 0.27 K-factor at 75 degree F. Armstrong Armaflex or approved equal.

F. Fire Wrap: Foil encapsulated non-combustible, inorganic, flexible fire proofing wrap; 0.460 BTU/HR FT2 at 500 degree F, 1-1/2" thick, UL listed undergrease duct enclosures; YYET, R14229 firestop system CAJ7004, 3-hour for zero clearance protection to combustibles.

G. Aluminum Roll Jacketing: 0.016 inch thick aluminum jacketing and fittings.

H. Vapor Barrier Adhesive: Low-odor vapor barrier. ASTM-84.

PART 3– EXECUTION

3.1 PREPARATION

A. Do not install covering before ductwork and equipment have been tested and approved.

B. Ensure surface is clean and dry prior to installation.

C. Apply finishes with system at ambient conditions.

3.2 INSTALLATION

A. Install all insulation and apply all sealants, and finishes in strict accordance with manufacturer's printed installation procedures.

B. Insulation shall be continuous through wall, floor and ceiling openings and sleeves.

C. At all pipe hanger locations where the insulation must resist compression and piercing, supporting devices must be used in combination with metal hanger shields. Supporting devices such as foamglass dowels which have the same thickness of the insulation shall be used. Coat the dowel with an approved adhesive before insertion into the insulation and coat the outer surface to provide a vapor seal.

D. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

E. Locate seams in least visible locations.

F. Mineral Wool Pipe Insulation:
   1. Apply insulation to pipe and seal longitudinal seam with pressure sensitive adhesive lap. Seal butt joints with vapor barrier adhesive. Finish with vapor barrier adhesive and 4-inch strips of facing material. Overlap adjacent pipe 2 inches minimum.
   2. Seal ends of pipe insulation at valves, fittings, flanges, etc. and at 21-foot intervals on continuous runs with vapor barrier sealant.
   3. Fittings: Apply insulation to the same thickness as the adjoining pipe. Finish with white PVC fitting covers and seal all joint with PVC adhesive and PVC tape. Finish shall overlap adjacent insulation by 2 inches minimum.
   4. Valves, Strainers and Flanges Cold Service: Provide covers fabricated from insulation of the same thickness as the adjoining pipe. Overlap the adjacent insulation by 4 inches minimum. Pack voids with glass fiber blanket. Apply vapor barrier adhesive to all butt joints. Fabricate in a minimum of sections to facilitate service and replacement. Finish with white PVC fitting covers and seal all joints with PVC adhesive and PVC tape.
   5. Valves, and Strainers Hot Service: Insulate valves as described above for cold service. Do not insulate union, flanges and expansion joints. Terminate insulation on a bevel with plastic troweled material.
   6. Protect insulation at hangers, guides and rollers with 16-gauge galvanized metal saddles and a section of rigid foamglass insulation a minimum of 12 inches long.

G. Mineral Wool Equipment Insulation:
   1. Apply insulation board of the same thickness as the adjoining pipe. Overlap the adjacent insulation by 4 inches minimum. Pack voids with glass fiber blanket. Apply vapor barrier adhesive to all butt joints. Fabricate in a minimum of sections to facilitate service and replacement. Finish with vapor barrier adhesive and 4-inch strips of facing material overlapping all joints 2 inches minimum. Seal all joints with PVC adhesive and PVC tape.

H. Mineral Wool Duct Insulation:
   1. Concealed ducts shall be insulated with blanket insulation.
   2. Ducts up to seven feet above floor in mechanical rooms, mezzanines, etc., shall be insulated with board insulation. Ducts above seven feet shall be insulated with blanket insulation.
   3. Ducts located outdoors shall be insulated with board insulation, minimum R-8, and finished as specified below unless the ductwork is specifically noted to be internally lined.
   4. Ducts shall be double-wall construction when located indoors, outside of mechanical rooms and exposed to view.
   5. Apply insulation to duct with ends firmly butted. Compress duct wrap a maximum of 25%.
   6. Adhere insulation with adhesive applied in 6-inch wide strips around the duct perimeter 16 inches on center.
   7. On ducts 18 inches wide or over, additionally secure with mechanical fasteners 16 inches on center.

8. Overlap the facing on longitudinal seam a minimum of 2 inches and seal with 100% coverage of adhesive. Staple in place with outward clinch staples.
9. Seal all staple and fastener penetrations and any other breaks in the vapor barrier with vapor barrier mastic.
10. Air distribution devices shall be insulated with blanket insulation.
11. Provide a section of rigid foam glass insulation a minimum of 12 inches wide at trapeze hangers.
12. All exposed hot water coil headers at fan powered boxes shall be externally insulated with mineral wool blanket insulation.

I. Flexible Elastomeric Insulation:
1. Apply pipe insulation as recommended by the manufacturer.
2. Stagger all butt joints and longitudinal joints. Cover joints when multiple layers are used.
3. Seal all joints and seam with Armstrong 520 adhesive or equal.
4. Paint exterior insulation with approved pigmented plasticized vinyl lacquer. Apply per manufacturer's specification.

J. Fire Resistive Duct Wrap:
1. Install in accordance with all manufacturer's instructions and referenced standards.

K. Insulation Saddles:
1. Provide metal straps on each end of the saddle.

3.3 FINISHES

A. Finish piping exposed outdoors with aluminum jacketing secured with aluminum bands. Provide pre-molded aluminum fitting covers for fittings, valves, etc. Seal all joints with clear silicone sealant.

B. Finish insulated ductwork exposed outdoors with 0.016-inch thick textured aluminum overlapped and adhered with rivets so as not to penetrate the vapor barrier. Apply an extra strip of insulation in the center of the top so that the aluminum is peaked to allow for drainage. Seal all joints with clear silicone sealant. Overlap and seal rivets in a manner to shed rainwater and provide a weathertight seal.

C. Finish all exposed chilled and hot water piping up to seven (7) feet above floor in mechanical rooms with 20 mil PVC jacket.

D. Finish all chilled water piping exposed in underfloor crawl spaces with 20 mil PVC jacket.

3.4 MATERIAL SCHEDULE

A. Piping
1. Refrigerant Suction. - flexible elastomeric
2. Condensate Drain. - glass mineral wool

B. Ductwork:
1. Supply Air Ducts. - glass mineral wool
2. Outside Air Ducts. - glass mineral wool
3. Return Air Ducts. - glass mineral wool
4. Relief Air Ducts. - glass mineral wool
5. Kitchen Hood Grease Duct - fire wrap
6. Kitchen Hood Above Ceiling - fire wrap
7. Grease Ducts - fire rated encapsulated blanket

3.5 INSULATION THICKNESS SCHEDULES - PIPE

Minimum Pipe Insulation Thickness (in inches)							
Fluid Operating Temperature Range and Usage (°F)	Insulation Conductivity		Nominal Pipe or Tube Size (inches)				
	Conductivity Btu▪in./(h▪ft²▪°F)	Mean Rating Temperature, °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≤8
>350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
85-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-84	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

B. Ducts:

1. Supply and return air ducts and plenums shall be insulated with a minimum of R-6 insulation where located in unconditioned spaces and where located outside the building with a minimum R-8 insulation in Climate Zones 1 through 4 and a minimum of R-12 insulation in Climate Zones 5 though 8. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation in Climates Zones 1 through 4 and a minimum of R-12 insulation in Climate Zones 5 through 8.

2.

Service	Minimum Labeled Thickness	Installed Compressed Thickness
Supply Air Ducts	2 inches	1.5 inches
Return Air Ducts	2 inches	1.5 inches
Outside Air Ducts	2 inches	1.5 inches
Exhaust Air Ducts	2 inches	1.5 inches

Insulation is not required on double wall ducts.

END OF SECTION

SECTION 230800 - COMMISSIONING OF HVAC SYSTEMS

PART 1– GENERAL

1.1 COMMISSIONING AGENCY

A. The commissioning agency (CA) has been contracted directly with the owner for this project. The CA has overall responsibility for planning and coordinating the commissioning process. However commissioning involves all parties to the design and construction process, including the mechanical (Division 23) contractor, and all specialty sub-contractors within Division 23, such as sheet metal, piping, refrigeration, water treatment, and controls, plus major equipment suppliers as required.

1.2 CONTRACTOR RESPONSIBILITY

A. The mechanical (Division 23) contractor's responsibilities are defined in Division 01 of the specifications. These responsibilities apply to all specialty sub-contractors and major equipment suppliers within Division 23. Each contractor and supplier shall review Division 01, and their bids shall include for carrying out the work described, as it applies to each Section within the Division 23 specifications, individually and collectively.

PART 2– PRODUCTS: NOT APPLICABLE

PART 3– EXECUTION: NOT APPLICABLE

END OF SECTION

SECTION 231123 - NATURAL GAS SYSTEM

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Natural Gas Piping System.

1.2 SUBMITTALS

A. Manufacturer's product data showing dimensions, materials, fittings, solders, pressure rating, and installation instructions.

1.3 QUALITY ASSURANCE

A. NFPA 54 National Fuel Gas Code.

B. Local Codes and Amendments.

C. Welding shall comply with A.W.S. standards.

PART 2– PRODUCTS

2.1 PIPING

A. Piping aboveground shall be standard weight, Schedule 40 black steel pipe.

2.2 FITTINGS

A. Steel gas piping 2 inches and smaller shall have threaded joints. Fittings shall be 150 lb screwed malleable iron. Steel gas piping systems 2-1/2 inches and larger shall be fabricated using standard weight steel welding fittings and 150 lb steel flanges.

B. Press-fit fittings rated for fuel gas use in schedule 40 steel pipe systems. Viega Mega Press G or equal.

2.3 REGULATORS

A. The regulator shall be cast iron body with die cast aluminum alloy diaphragm case. The diaphragm shall be Buna-N with nylon fabric reinforcement. Regulator shall have an internal relief valve and low pressure cut-off capability. Inlet and outlet pressures and sizes shall be as indicated on drawings.

B. ACCEPTABLE MANUFACTURERS
The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

1. Equimeter
2. Fisher
3. Maxitrol

4. Schlumberger

PART 3– EXECUTION

3.1 INSTALLATION

A. Interior gas piping shall be installed so as to grade to drip pipes no smaller than the gas main which they drain. Drip pipes shall not be less than 12 inches and terminate with a threaded cap. Drip pipes shall not be used as outlets for the attachment of any fixture of gas appliance. Drip pipes must be placed at the bottom of all vertical pipes which rise from and connect to the end of any horizontal pipe.

B. Install gas piping in open ventilated spaces or above ceiling where permitted by local codes.

C. Piping installed above the ceiling, in the plenum space, shall be welded.

D. At points where branches take off of mains, and at other locations designated on the Drawings, provide and install stop cocks. At each item of equipment served with gas, provide and install a shut-off valve. These valves shall be in addition to any control valves provided on the equipment.

E. All branch outlet pipes shall be taken from the top or sides of running horizontal lines. Crosses shall not be installed in horizontal gas line. Unions, gas cocks, or valves shall not be concealed.

F. Purge all gas lines with inert gas after testing and prior to the introduction of fuel gas.

G. All exterior gas piping, piping installed in Mechanical/Boiler Rooms, piping installed in kitchens shall be primed and painted with (2) coats of “SAFETY YELLOW” epoxy paint.

H. Provide a shut-off valve immediately upstream of all regulators.

I. Provide unions at regulators with threaded ends.

J. Provide 3/4" valved and plugged test tees on the inlet and outlet side of regulators.

K. Provide a 3/4” valved and plugged test tee on all unregulated branches at the gas meter header.

L. Provide dirt legs at all appliance / equipment connections.

M. Press-fit fittings shall be installed in accordance with the manufacturer’s instructions.

3.2 TESTING

A. All gas piping system shall be tested by the Contractor. The new piping system shall be subjected to 50 psig air pressure and the existing system to 10 psig and all joints shall have a soapy water solution applied for the purpose of detecting minute leaks, as well as large ones. If leaks are found, they shall be repaired. Alternate testing and repair operations shall be repeated until the gas piping system is absolutely tight at the pneumatic test pressure indicated above. Such gas piping system must be demonstrated to be absolutely tight when subjected to this pressure for a period of twenty-four (24) hours.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING AND SPECIALTIES

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Refrigerant Piping System.

B. Liquid Indicators.

C. Strainers.

D. Refrigerant Driers.

E. Filter-Driers.

F. Solenoid Valves.

G. Expansion Valves.

H. Refrigerant Charging Valves.

I. Flexible Connections.

1.2 SUBMITTALS

A. Submit minimum 1/4-inch scale shop drawings of piping systems, double lined for piping 4 inches and over, accurately drawn and carefully coordinated with all other trades. Show bottom of pipe elevations or sections.

B. Pipe and Pipe Fittings: Manufacturer's data showing materials, ASTM designation, dimensions and schedule.

C. Specialties: Submit manufacturer's product data showing materials, dimensions, capacity and performance data and installation instructions.

1.3 QUALITY ASSURANCE

A. Install refrigerant specialties in accordance with manufacturer's printed installation instructions.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provide the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specification Section 230500 for additional requirements.

A. Specialties:
   1. Henry.
   2. Sporlan.

2.2 PIPE AND PIPE FITTINGS

A. Refer to Section 23 20 00 for general materials and methods.

2.3 REFRIGERANT PIPING

A. Type ACR copper tubing, hard temper with wrought copper fittings for systems over 5 tons. For systems 5 tons and less annealed Type ACR tubing may be used.

B. Brazed, phos-copper alloy or bronzed, silver alloy shall be used.

2.4 LIQUID INDICATORS

A. Double port type with copper or brass body, and flared or solder ends.

B. Provide removable seal caps on each port for inspection of refrigerant condition.

C. Provide full size liquid indicators in main liquid line leaving condenser. If receiver is used, install in liquid line leaving receiver.

2.5 STRAINERS

A. Angle type with brass shell and replaceable cartridge.

B. Suitable for refrigerant and piping material utilized in the system.

C. Provide full size strainer ahead of each automatic valve. Where expansion valves with integral strainers are used install single main liquid line strainer.

D. Provide shut-off valve on each side of strainer to facilitate maintenance.

2.6 REFRIGERANT DRIERS

A. In-line or angle type with copper or brass shell.

B. Employ replaceable desiccant drier material.

C. Provide full flow permanent refrigerant drier in low temperature systems and systems utilizing hermetic compressors.

D. Provide three-valve bypass assembly.

2.7 FILTER-DRIERS

A. Angle type, with brass shell and using combined straining and drying material.

B. Employ replaceable desiccant material.

C. Acceptable in lieu of separate strainers and driers.

D. Provide three-valve bypass assembly.

2.8 SOLENOID VALVES

A. Copper or brass body with flared or threaded ends.

B. Use replaceable coil assembly.

C. Provide a manually operated stem to permit operation in case of coil failure.

D. Provide solenoid valves in liquid line of systems operating with single pump-out and pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

2.9 EXPANSION VALVES

A. Angle type or straight through design suitable for the refrigerant utilized in the system.

B. Brass body, internal or external equalizer, and adjustable superheat setting, complete with capillary tube and remote sensing bulb.

C. Size expansion valves to avoid being undersized at full load and excessively oversized at partial load.

D. Evaluate refrigerant pressure drop through system to determine the available pressure drop across each valve.

E. Select valves for maximum load at design operating pressure and minimum 43 degreed F of superheat.

2.10 CHARGING VALVES

A. General purpose type with brass body, flared or solder ends, and removable valve core.

B. Provide valve inlet with quick coupling connection for ease of charging.

C. Provide refrigerant charging connections in liquid line between receiver shut-off valve and expansion valve.

2.11 FLEXIBLE CONNECTORS

A. Close pitch corrugated bronze hose with single layer of exterior braiding.

B. At least 9 inches long with bronze fittings.

C. Utilize only at or near compressor where it is not physically possible to absorb vibration within piping configuration.

PART 3– EXECUTION

3.1 PIPING

A. Confirm refrigerant line sizes with equipment manufacturer.

B. Grade and trap piping as necessary to facilitate oil return.

C. Install piping with careful regard to expansion.

D. Joints shall be made up in the presence of dry nitrogen only and shall be tested before any coverings applied using dry nitrogen and freon under pressure as described hereinafter. High side shall be tested at 400 psig and the low side at 250 psig.

E. After the system has been found tight, the system shall be charged in accordance with manufacturer's recommendations. All joints shall be carefully tested with liquid soap and electronic leak detectors, and if a leak is found the joint shall be remade as described above. If no leaks are found, system shall be evacuated to a deep vacuum using an approved auxiliary vacuum pump. A vacuum dehydration indicator shall be used—dial type gauges will not be acceptable. The vacuum pump shall be operated until a reading of 250 microns is obtained with a wet bulb temperature less than 35 is obtained. The vacuum pump shall be valved off and the vacuum in the system shall be broken with dry nitrogen. The system shall be evacuated again to 250 microns.

F. Provide expanded rubber insulation to suction return line and paint exterior insulation with approved pigmented plasticized vinyl lacquer. Apply per manufacturer's specification.

3.2 TESTING

A. Test piping systems prior to the application of insulation.

B. For piping installed in concealed spaces or buried, test piping before system is concealed or back filled.

C. After testing, and whenever conditions permit, operate systems at normal operating pressure and temperature for not less than five consecutive days. The piping systems must remain free from leaks during this period.

3.3 REFRIGERANT DRIERS

A. Mount drier vertically in liquid line adjacent to receiver with bypass assembly to permit isolation of drier for servicing.

3.4 FILTER-DRIERS

A. Install with bypass assembly to permit isolation for servicing.

3.5 EXPANSION VALVES

A. Locate expansion valve sensing bulb immediately after evaporator outlet on suction line.

END OF SECTION

SECTION 233100 - DUCTWORK AND ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Ductwork and accessories including the following:
   1. Supply air, return air, outside air and exhaust systems.
   2. Duct lining.
   3. Acoustical apparatus casing.
   4. Low pressure corrosion resistant exhaust systems including the following:
      a. Wet air exhaust.
      b. Laboratory fume hoods.
   5. Medium pressure (negative) exhaust systems.
   6. Duct Leakage Testing.

1.2 DEFINITIONS

A. Seal or sealing: Use of liquid or mastic sealant, with or without compatible tape overlay, or gasketing of flanged joints, to keep air leakage at duct joints, seams and connections to an acceptable minimum.

B. Duct Pressure Classification:
   1. Low Pressure: Static pressure rating up to 2 inches wg (water gauge), positive or negative.
   2. Medium Pressure: Static pressure rating up to 4 inches wg positive, or 3 inches wg negative pressure.
   3. High Pressure: Static pressure rating up to 10 inches wg positive pressure, greater than 3 inches wg negative pressure.

1.3 QUALITY ASSURANCE

A. Refer to paragraph, Quality Assurance, in Section 23 05 00, Basic Mechanical Requirements.

B. Fire Safety Code: Comply with NFPA 90A, 90B, 92A, 92B and 96.

C. Duct System Construction: SMACNA HVAC Duct Construction Standards, Third Edition 2005, are minimum acceptable quality. When specific requirements for ductwork are made in the specification or drawings, these requirements will take precedence over SMACNA Standards.

D. Duct accessories exposed to the air stream, such as dampers of all types and access openings, shall be of the same material as the duct or provide at least the same level of corrosion resistance.

E. A representative sample of the duct system will be leak tested.

1.4 SUBMITTALS

A. Refer to paragraph, Submittals, in Section 23 05 00, Basic Mechanical Requirements.

B. Manufacturer's Literature and Data:
   1. Ductwork:
      a. Schedules of duct systems, materials, joint and seams, gauge and reinforcement type, spacing and pressure class.
      b. Duct liner.
      c. Sealants and gaskets.

d. Manufacturer's details for round and flat oval duct and fittings.
e. Manufacturer's details for double wall internally-insulated duct and fittings.

2. Duct supports.
3. Access door sizes and construction.
4. Volume dampers, backdraft dampers.
5. Fire dampers, smoke dampers and fire doors with installation instructions.
6. Flexible ducts and clamps, with manufacturer's installation instructions.
7. Spin in collars with dampers.
8. Flexible connections.
9. Air intake/exhaust hoods.
10. Instrument test fittings.
11. Perforated distribution plates.
12. Air Flow measuring stations.

C. Ductwork drawings at 1/4 inch equal 1'-0" scale drawings clearly showing the pressure class to which all ducts have been constructed and referencing construction details.

D. Construction details of Air Conditioning Apparatus Casing including mounting of coils, filters, etc.

PART 2– PRODUCTS

2.1 DUCT MATERIALS

A. General: Except for system specified otherwise construct ducts, casings, and accessories of galvanized sheet steel. Galvanized sheet steel shall have minimum ASTM A525, G90 coating.

B. Kitchen Hood Exhaust:
1. Fabricate in accordance with SMACNA Duct Construction Standards-Metal in accordance with NFPA 96.
2. Construct of 16-gauge carbon steel or 18-gauge stainless steel using continuous external weld joints.

C. Factory Built Kitchen Hood Exhaust
1. Furnish double-wall, factory-built, insulated grease duct that conforms to the requirements of NFPA-96. Products shall be listed by ICBO Evaluation Services, BOCA Evaluation Services and by SBCCI PST & ESI as a two-hour fire-rated grease duct assembly with a maximum 3" clearance to combustibles for installation in multi-story buildings without a fire-rated enclosure when penetrations of fire-rated partitions are firestopped with the Model PIC PPK Firestop.
2. The inner wall shall be constructed of .035" thick type 304 stainless steel for diameters 6" through 36".
   a. Optional: The inner wall shall be constructed of .035" thick type 316 stainless steel for diameters 6" through 36".
3. The outer wall shall be constructed of .024" thick aluminized steel for sizes 6" through 24" and .034" thick for sizes 26" through 36".
   a. Optional: The outer wall shall be constructed of type 304 or 316 stainless steel, .024" thick for all sizes.
4. Grease duct shall incorporate 2" (4") of high temperature ceramic fiber insulation between the inner and outer wall.
5. All supports, roof penetrations, fan adapters, square-to-round transitions, hood connectors, drain fittings and expansion joints required to install grease duct shall be included.
6. Roof penetration pieces shall be listed products of the grease duct manufacturer. Where roof is pitched (up to 12 :12), roof penetration pieces shall be of the pitched type so that it is not necessary to provide a horizontal roof curb.

7. Grease duct exposed to weather shall be protected with one base coat and one finish coat of heat resistant paint or have stainless steel shell. Paint to be furnished and applied by installer.

2.2 JOINT SEALING

A. Joint Sealing:
   1. Sealant: Water based, non-toxic, non-combustible and flame resistant in wet or dry state, maximum 25 flame spread and 50 smoke developed compounded specifically for sealing ductwork. Sealant shall be Type MP as manufactured by Trans Continental Equipment Ltd. or water based duct sealer as manufactured by United McGill Corporation.
   2. Gaskets in flanged joints: Soft preformed mastic strip. Minimum thickness 1/8 inch for ducts up to 48 inches wide, for larger ducts the gasket material shall be not less than 3/16 inch thick.

B. Approved joints such as DUCTMATE SYSTEM or approved equal may be used. All corners shall be secured with bolts and intermediate flange clips shall be provided at 12 inches o.c. for joints on duct side of 24 inches or larger.

2.3 LOW PRESSURE DUCTWORK

A. Low pressure ductwork, gauges, reinforcement, joints, seams, sealing, fittings, supports and other details shall be in accordance with SMACNA HVAC Duct Construction Standards except as modified below.

B. Gauges: Low pressure ducts shall be constructed in accordance with Table 1-5 except that the minimum sheet metal thickness shall be 24-gauge.

C. Cross Joints: The following limitations shall apply to the cross joints listed below:
   1. Standing drive slips will not be acceptable.
   2. Single Standing S slips will not be acceptable.
   3. Hemmed S, inside slip and double S slips may be used in combination with a drive slip for duct sides not exceeding 24 inches long.
   4. Double Standing S slips (T10, T11, T12) will be acceptable for duct sides not exceeding 30 inches long provided that both upstream and downstream sides of the slip joint are sealed at the junction of the duct and the slip.
   5. Combination cross joints of Double Standing S or Pocket Lock slips on the long side and flat drive slips on the short side are acceptable provided the length limitations state in 3) and 4) are not exceeded.
   6. Joint spacing or joint/reinforcement spacing for approved joints such as Ductmate, exus, etc.

Maximum duct size (large side)		24”	32”	40”	48”	60”	70”
Pressure	Joint Size	Max. spacing between joints and stiffeners					
Up to 2”	7/8” Flange ht.	78”	60”	48”	24”	--	--
	1-3/8” Flange ht.	78”	60”	48”	40”	32”	32”

D. Seams: Button punch snap lock seams shall be sealed along their entire length. Sealant may be applied during or after construction.

E. Elbows: All elbows having a side length less than 12 inches in the plane of rotation shall be standard radius elbows. Elbows with side length 12 inches or greater, may be, standard radius, short radius with internal concentric full length splitters bolted to duct sides or square with turning vanes as SMACNA Fig. 2.2 pages 2-3. Short radius elbow splitters shall be positioned to ensure that the first splitter radius does not exceed twice the throat radius of the elbow. Subsequent splitters radii shall not exceed twice the previous splitter radius.

F. Offsets: Offsets shall be formed as partial angle radius elbows. 90-degree turning vanes will not be acceptable. Mitered offsets will be acceptable provided the angle of offset does not exceed 30 degrees.

G. Branches: All branch connections shall be provided with a manual volume control damper in the branch duct. Rectangular 90-degree branch connections supplying two or more outlets shall connect to the main duct with a 6-inch long 45-degree taper on the leading edge. Circular 90-degree branch connections supplying two or more outlets shall connect to the main duct with conical or bell mouth connectors. Circular branch connections to an air outlet device may use a spin-in collar fitting.

H. Volume Dampers: Single blade or opposed blade, multi-louver type as detailed in SMACNA Standards, Figures 2-14 and 2-15. Provide end bearing for all dampers. Quadrant or other operator for externally insulated duct shall have stand-off mount so operation is clear of the insulation. Internally insulated duct shall have sheet metal liner of same gauge as duct for one lineal foot before and after the damper.

I. Automatic Operated Dampers: Section 23 09 23 - Controls.

J. Backdraft Dampers: Damper shall be counterbalanced and suitable for velocities to 2,500 feet per minute (open) and pressures to 16 inches wg (closed). Damper shall begin to open at 0.01 inch wg and be fully open at 0.06 inch wg. Frame shall be minimum 0.081-inch thick extruded aluminum. Blades shall be single piece, minimum 0.070-inch thick extruded aluminum, maximum 6 inches wide, and shall close within frame. Blades shall be horizontal with parallel action. Tie bar shall be minimum 1/2-inch with stainless steel pivot pins. Blade seals shall be extruded vinyl, mechanically attached to blade edge. Glue-on or clip-on seals are not acceptable. Counterbalances shall be adjustable zinc-plated steel weights mechanically attached to blade enabling blade to operate over wide range of pressures. Damper shall be Ruskin CBD4 or approved equal.

2.4 MEDIUM/HIGH PRESSURE DUCTWORK

A. Gauges, joints, seams, reinforcement, fittings, supports and other details for rectangular, round and flat oval duct shall be in accordance with SMACNA, HVAC Duct Construction Standards except as modified below.

B. Gauges: Medium pressure rectangular ducts shall be constructed in accordance with Table 1-7 except that 24-gauge sheet metal thickness shall be restricted to ducts with sides not exceeding 12 inches long.

High pressure rectangular duct, shall be constructed in accordance with Table 3-2a except that the minimum sheet metal thickness shall be 22-gauge.

Circular ducts shall be constructed in accordance with Table 3-2a using the 10-inch pressure column minimum 24 gauge. Flat oval ducts shall be constructed in accordance with Table 3-4.

C. Cross Joints:
1. Slip joints (flat drive, S, Pocket Lock, etc.) will not be acceptable for high pressure ducts. Single Standing S slips will not be acceptable for medium pressure ducts.

2. Flat drive slips on medium pressure ducts shall not be used for duct sides exceeding 16 inches long. Duct reinforcement shall be in accordance with Table 1-18.
3. Double Standing S Slips (T10,T11,T12) will be acceptable for medium pressure duct construction for duct sides not exceeding 24 inches long provided that both the upstream and downstream sides of the slip joint are sealed to meet the duct leakage criteria. The Contractor shall understand that extensive use of S slips in medium pressure duct installations may render the duct system unable to meet the pressure/leakage requirements referenced in Part 3 of this specification.
4. Joint spacing or joint/reinforcement spacing for approved joints such as Ductmate, Nexus, etc.,

Maximum duct size (large side)		24”	32”	40”	48”	60”
Pressure	Joint Size	Max. spacing between joints and stiffeners				
Up to 4”	7/8” Flange ht.	48”	32”	24”	--	--
	1-3/8” Flange ht.	64”	48”	40”	32”	24”
Up to 10”	7/8” Flange ht.	48”	24”	--	--	--
	1-3/8” Flange ht.	48”	40”	32”	24”	--

D. Seams: Button punch snap lock seams will not be acceptable for high pressure ducts.

E. Round and Flat Oval Ducts: Furnish duct and fittings made by the same manufacturer as the straight duct to ensure good fit of slip joints:
1. Elbows: Diameters 3 through 10 inches shall be die stamped, all others shall be gored construction with all seams continuously welded as Fig. 2-4. Coat galvanized areas of fittings damaged by welding with corrosion resistant aluminum paint or galvanized repair compound.
2. Provide bellmouth, conical tees, laterals, reducers, and other low loss fittings as shown in SMACNA Standards. Square branches will not be acceptable.

F. Provide flat side reinforcement of flat oval ducts as SMACNA Fig. 3-6, *Type 2. Do not use internal tie-rod reinforcement unless approved by the Engineer.

G. Duct Hangers and Supports: Comply with SMACNA HVAC Duct Construction Standards, Section IV. Trapeze hangers for round duct will not be acceptable.

2.5 DOUBLE WALL DUCT

A. System shall consist of perforated galvanized steel inner liner, neoprene coated glass fiber acoustical insulation and spiral would galvanized outer duct. Materials shall be inert, vermin and moisture proof, and odorless. A tightly woven fiberglass cloth equal to BGF Industries or JPS Style 7628 shall be installed between the acoustical blanket and perforated inner duct. Material shall comply with ASTM E-84, NFPA 90A-1993 and UL requirements, and shall have the following maximum fire classification values:
1. Flame Spread 25.
2. Fuel Contributed 20.
3. Smoke Developed 0.

Insulation shall be adequate to prevent condensation on the outside of the outer duct under normal operating conditions. Panels shall be mounted using neoprene gaskets and rubber washered, cadmium plated screws.

B. Terminated ends of double wall system with factory made adapters at transition to different construction.

C. Fittings, transitions and air device taps shall be factory made by the same manufacturer and shall be of the same construction as the straight duct.

D. Ducts shall be double-wall construction when located indoors, outside of mechanical rooms and exposed to view.

2.6 CLOTHES DRYER EXHAUST (RESIDENTAIL TYPE)

A. Dryer exhaust duct shall be constructed to low pressure ductwork standards.

B. Dryer exhaust ducts shall have a smooth interior finish.

C. Metal shall be minimum of .016 inch thick.

D. Dryer exhaust ducts shall be supported at 4'-0" intervals. Ducts shall not be joined together with screws or similar fastener that protrude into the inside of the duct more than 1/8" inch.

E. Total equivalent length shall not be greater than 35'-0". Coordinate maximum length with dryer's manufacturers recommendations.

F. Connections from dryer to exhaust duct system shall be a single length. Duct shall be a maximum 8 feet.

G. Annular space between duct and wall penetration shall be sealed with approved fire caulking or non-combustible dryer exhaust duct wall receptacle.

2.7 DUCT LINING

A. Acceptable Manufacturers:
   1. Lining material:
      a. Certainteed Manson.
      b. Knauf.
      c. Ownes Corning Aeroflex.
      d. Schuller Linacoustic.
   2. Adhesive:
      a. Benjamin Foster.
      b. Childers.
      c. GEMCO.
      d. 3M.
      e. United McGill.

B. Materials:
   1. All insulation materials, adhesive, jackets, etc., shall be vermin-proof and non-combustible and shall have a flame spread/smoke developed rating of 25/50 or less.
   2. Lining shall have the following features:
      a. 1.5 LB/CF density for ducts and 2 LB/CF density for casings.
      b. Mat facing on the air stream side.
      c. Rated for 5,000 FPM.
      d. Rated for 250 degrees F.

C. Provide lining where Specified herein. Refer to Schedule of Materials at the end of this Section. Lining shall be 1.5 inch thick unless indicated otherwise. Ducts installed outdoors shall be lined with 2.0 inch thick insulation (minimum R-8).

D. Duct sizes shown on Drawings are clear inside dimensions. Metal duct sizes shall be increased to allow for lining where specified.

2.8 DUCT ACCESS DOORS, PANELS AND SECTIONS

A. Provide hinged access doors, sized and located for maintenance work, upstream where possible, in the following locations:
   1. Each coil and humidifier.
   2. Each fire damper (for link service), smoke damper, combination fire/smoke damper, and automatic control damper.
   3. Each duct mounted smoke detector.
   4. Each change in direction at required intervals and at grease reservoirs of kitchen exhaust ducts for cleaning.
   5. In hospitals as required for cleaning operating room supply air duct downstream of final filter, operating room return air ducts and operating room exhaust ducts.

B. Opening shall be as large as feasible in small ducts, 12 inches by 12 inches minimum where possible and 18”x18” in 20 inches or wider cuts. Access doors in insulated ducts shall be double-wall, insulated, and mounted on stand off frames to insulation thickness.
   1. For rectangular ducts: Refer to SMACNA (Figure 2-12).
   2. For round and flat oval duct: Access sections shall be not less than 20-gauge housing welded or riveted to a duct section. Typical units are United Sheet Metal Type AR.

C. All access doors shall be labeled (1/2-inch high lettering) to indicated device to be serviced.

2.9 CURTAIN TYPE FIRE DAMPERS

A. Use in ducts and openings under 3 sq. ft.

B. Galvanized steel, interlocking blade, curtain type fire damper with UL listing and label, 1-1/2 hour rating, 165 degrees F fusible link, with pressure drop performance equal to blade stack out of air stream. Damper frame shall be minimum 20-gauge. Damper blades shall be minimum 24-gauge. Fire dampers in fume hood exhaust, wet air exhaust or in salt air application shall be stainless steel construction. Provide fire dampers where indicated on the Drawings and where required by local codes.

C. Fire dampers for grilles, where walls will not accommodate standard fire dampers, shall be thinline type, same construction as standard fire dampers.

D. Dampers shall be furnished with sleeves and retaining angles in accordance with UL 555.

E. All dampers shall be in accordance with NFPA 90A and in accordance with UL for the fire rating indicated. All dampers shall be marked “For Use in Dynamic Systems”.

F. Dampers shall be classified for dynamic closure to 2000 fpm and 4 inches w.g. static pressure.

G. Provide Ruskin Model DIBD or approved equal.

2.10 MULTIPLE BLADE TYPE FIRE DAMPERS

A. Use in ducts and openings 3 sq. ft. and over.

B. Galvanized steel multiple blade type with UL-555 listings and label, 1-1/2 hour rating, 165 degrees F reusable thermal link. No part frame or stops shall be in the air stream. Fire dampers in corrosive systems shall be coated with an approved phenolic for acids being encountered. Fire dampers in normal fume hood exhaust, wet air exhaust or salt air application shall be stainless steel construction.

C. Damper Sizing: Damper sizes shall be the same as the duct size except as follows:
   1. Minimum dimension of any side or diameter shall be 8 inches. Ducts smaller than the minimum fire damper size shall be supplied with smooth transformation on upstream and downstream ducts, the fire damper access door shall be provided in the enlarged duct section.
   2. Maximum Free Area Velocity:
      a. Low Pressure Ducts – 1500 FPM.
      b. Medium/High Pressure Ducts – 2000 FPM.

D. Construction:

1.	Frame	-	16-gauge steel hat channel.
2.	Blades	-	Galvanized steel, parallel blade type, 12 inches maximum width. Linkage concealed in frame.
3.	Bearings	-	Stainless steel or brass.
4.	Shaft	-	Minimum 1/2-inch diameter, blade shall be locked to shaft to prevent movement independent of shaft motion.
5.	Thermal Link	-	UL 33 manual thermal link with quick release and hand quadrant. Temperature setting 165 degrees F.

2.11 SMOKE DAMPERS

A. Galvanized steel, multiple blade type with UL-555S listing and rating. No part of the frame or stops shall be in the air stream. Smoke dampers in corrosive systems shall be coated with an approved phenolic for acids being encountered. Smoke dampers in normal fume hoods, wet air exhaust or salt air application shall be stainless steel construction.

B. Classification: (UL-555S Definitions)
   1. Leakage Class – II Maximum 10CFM/FT^2 at 1 inch H_2O.
   2. Temperature Category – 250 degrees F.

C. Damper Sizing: Damper sizes shall be the same as the duct size except as follows:
   1. Minimum dimension of any side or diameter shall be 8 inches. Ducts smaller than the minimum fire damper size shall be supplied with smooth transformation on upstream and downstream ducts, the fire damper access door shall be provided in the enlarged duct section.
   2. Maximum Free Area Velocity:
      a. Low Pressure Ducts – 1500 FPM.
      b. Medium/High Pressure Ducts – 2000 FPM.

D. Construction:

1.	Frame	-	16-gauge steel hat channel. Jamb seals shall be stainless steel.
2.	Blades	-	14-gauge galvanized steel, parallel blade type, 12 inches Maximum width. Blades shall be airfoil-shaped, single piece construction with seals mechanically locked into blade edge. Adhesive clip-on seals are not acceptable. Linkage in air stream for uniform expansion.
3	Bearings	-	Stainless steel.
4.	Shaft	-	Minimum 1/2-inch diameter, blade shall be locked to shaft to prevent movement independent of shaft motion.

E. Operator: Motors shall be adequately rated for the damper size, but shall have a rated torque not less than 50 in.-lbs. Motors shall be 120 volt – 1 phase with a rating not to exceed 80W and be provided with a low wattage holding coil.

2.12 COMBINATION FIRE AND SMOKE DAMPERS

A. Combination fire and smoke dampers shall meet the requirements for Smoke Dampers with the following exception:
   1. Thermal actuation shall be by means of a “controlled closure” heat actuated release device, designed to close from 3 to 15 seconds when the temperature within the duct reaches or exceeds 165 degrees F. Instantaneous damper closure in unacceptable.
   2. The damper shall be capable of being reset locally and upon command through the fire alarm system after test, smoke detection or power failure. Refer to Division 26. The damper shall not be capable of being reset from a remote location if the damper has been thermally activated.

B. Dampers shall be furnished with sleeves and retaining angles in accordance with UL 555.

C. Provide Ruskin Model FSD-60 or approved equal.

2.13 CEILING RADIATION DAMPERS

A. Galvanized steel multiple blade type with UL 555 testing and rating. Damper shall be same size as return or supply air opening. No part of damper shall be in the air stream.

B. Provide dampers as required to protect HVAC penetrations in the ceiling membrane portion of a fire rated floor/ceiling or roof/ceiling assembly.

C. Dampers shall have 165 degrees F fusable thermal link.

2.14 FLEXIBLE AIR DUCT

A. General: Factory fabricated, comply with NFPA 90A. Flexible ducts shall not penetrate any fire or smoke barrier. Provide insulated, acoustical flexible duct in supply air duct systems. Provide only where permitted by local codes and licensing standards. Maximum length of flexible duct shall be six feet. Provide rigid round as required.

B. Insulated Flexible Air Duct: Factory made including CPE inner film on mechanical lock helix duct and mineral fiber insulation with maximum C factor of 0.20 at 75 degrees F mean temperature, encased with a reinforced metalized vapor barrier outer jacket. The use of adhesives to attach the helix to the inner core material in not acceptable.

C. Flexible ducts shall be listed by Underwriters Laboratories, Inc. complying with UL 181.

D. Flexible ducts shall be UL 181, Class I Air Duct.

E. The internal working pressure rating shall be at least 6" W.G. positive and 4" W.G. negative (up to 16 inch diameter) and 1” w.g. negative for 18” and 20” diameters with a bursting pressure of at least 2-1/2 times the working pressure.

F. The duct shall be rated for a velocity of at least 4000 feet per minute.

G. Factory insulate the flexible duct with fiberglass insulation to a minimum R-Value of R-6.

H. Flexible ducts shall be Flexmaster type 1M or Thermaflex Type M-KE, no exceptions.

2.15 FLEXIBLE CONNECTIONS

A. Where duct connections are made to fans and air handling units, install a non-combustible flexible connection of 29-ounce neoprene coated fiberglass fabric approximately six inches wide. For connections exposed to sun and weather, provide hypalon coating in lieu of neoprene. Burning characteristics shall conform to NFPA 90A. Refer to SMACNA Standards Section 2, Figure 2-17.

2.16 INSTRUMENT TEST FITTINGS

A. Manufactured type with a minimum two inch length for insulated duct, and minimum one inch length for duct not insulated. Test hole shall have a flat gasket for rectangular ducts and concave gasket for round ducts at the base, and a screw cap to prevent air leakage.

B. Provide instrument test holes at each duct or casing mounted temperature sensor or transmitter, and at entering and leaving side of each heating coil, cooling coil, sound attenuator and duct mounted filter units.

2.17 AIR FLOW MEASURING STATIONS

A. General: Provide solid state electronic-sensing air flow measurement systems as specified, and in the locations indicated on the Plans. Any conflict between the locations indicated and the manufacturer's placement guidelines for optimum performance shall be resolved by the Contractors involved, with changes subject to the approval of the Engineer and the equipment manufacturer.

B. The electronic air measurement system (EAMS) shall be a true an totally solid state electronic device comprised of the following:
   1. A thermistor-based sensor grid.
   2. Microprocessor-based electronics for flow averaging, temperature compensation and signal transmission. Air sampling and velocity pressure measurement equipment shall not be acceptable.

C. The EAMS shall be EBTRON or approved equal.

D. Each EAMS sensor grid shall consist of a lattice network of thermistors and linear IC's, situated inside an aluminum casing suitable for mounting in a duct. Each thermistor sensor shall be recess mounted within a strut, facing downstream of the air flow, located so that it is protected on the upstream side. All wiring shall be Teflon or Kynar coated and encased (out of the air stream) to protect against mechanical and environmental damage.

E. Sensor density per duct size, for Outside Air Intake, or for Supply, Return and Exhaust measurements, shall conform to the following (when flow rates are expected to fall below 1000 fpm):

Duct Free Area (ft^2)	Sensor Density (Typ.)
Less than 4	4 Sensors/ft^2
4 to 16	16 Sensors/unit
Greater than 16	1 Sensor/ft^2

F. The Contractor may use either a flanged or slot-fit (insertion-type) grid fame style. Sensors installed in ducts shall be insertion type. The casing (frame) shall be made of all-welded aluminum to the specific dimensions of the ducts for which each grid is intended to be installed. Each grid fame shall be of sufficient strength to prevent structural bending or bowing, after having be installed in accordance with the manufacturer's instructions. The Contractor shall also supply gasketing to seal the grid frame to the duct system, as required.

G. EAMS stations designated to measure Outside Air Intake (OA) shall be capable of functioning accurately between -20 degrees F and + 160 degrees F, and in ducts sized for a maximum fact velocity (at the intake louver) of 400 fpm, per ASHRAE Fundamentals Handbook 1989, p 32.15, fig. 11, table #8. Manufacturer's placement recommendations and guidelines for OA measurements shall be strictly observed.

H. Each sensor gird casing and electronics enclosure shall have a permanently mounted tag, showing: matching serial numbers, the system's output signal, full scale reading, flow capacity, size, actual internal flow area. Direction of flow will be indicated on the interior and exterior of the casing.

I. The electronics package shall consist of an enclosure which houses a completely solid-state microprocessor, permanent non-volatile memory, regulated power supply and a software-based system. (Optional – Each EAMS electronics shall be capable of indicating a system malfunction, yet continue to operate and avoid a system shut-down; while simultaneously indicating a malfunction to the user.)

J. The electronics shall have the ability to transmit signals of 0-5 VDC or 4-20 mA as required by the controls hardware, for use in the control of the HVAC system. These signal outputs shall be linear and available for both flow and temperature measurement. The system shall have the capability to accept user-defined scaling parameters for all output signals.

K. A single temperature-compensated average flow output signal shall be provided for each ducted location shown on the drawings. When multiple locations are required to achieve a single total flow, then one signal may be provided which will equal the sum of these locations.

L. Each electronics package shall be powered by a separate or isolated, single phase 24 VAC or 24 VDC power source and shall be protected from line surges and transients. Optional, a 120 VAC or 240 VAC power source may be utilized when transformed to 24 VAC, as specified. Multiple EAMS's may be powered from a single transformer, when the manufacturer's installation instructions are strictly followed.

M. The measurement system, which includes all components required to produce a linear-to-flow, temperature-compensated electronic output, shall be factory calibrated with a Total Accuracy of ±(2% of Reading, +20 fpm) across a total calibrated range of zero to 5000 fpm. Temperature measurement accuracy shall be better than ±0.5 degrees F from Reading. Field calibration shall not be required, when the manufacturer's minimum placement guidelines are followed. Pressure drop shall not exceed 0.005 in. WG (water gauge) at 2000 fpm. Repeatability shall be ±0.4% of reading or better.

N. Total EAMS Accuracy shall include and depend upon: temperature-compensation, humidity, repeatability, turbulence and placement. Any changes in duct configuration and/or changes in the physical placement of the grid array or duct accessories, as specified or recommended by the EAMS manufacturer is to be submitted and approved by the Engineer.

O. The successful Contractor is required to submit independent laboratory test results, verifying the station's accuracy potential, repeatability, and the effects of duct loading on output accuracy. Regular or periodic field maintenance shall not be required.

PART 3– EXECUTION

3.1 DUCT SEALING

A. Seal all transverse joints and all duct wall penetrations of low pressure and medium pressure ducts.

B. Seal all transverse joints, longitudinal joints and duct wall penetrations of high pressure ducts.

C. Seal joints and seams by applying layers of glass fabric tape embedded in coat of sealant. Tape shall overlap the joint a minimum of two inches. Apply finish coat of sealant to completely cover the tape.

D. Apply sealant within the slip joints of round and flat oval ducts during construction. Additionally, seal the joints as described above.

3.2 FLEXIBLE DUCT CONNECTIONS

A. The terminal ends of the duct shall be secured by steel worm duct clamp and shall be coated with 3M-E.C.800 or equal sealant, covered with fiberglass tape and recoated with sealant until the tape is imbedded. The insulation ends shall be sealed with tape and sealant.

B. Spin-in fittings shall be sealed at the duct tap with a gasket, or compression fit, or sealed with 3M-E.C. 800 or equal. The location of spin-in fittings in the ducts shall be determined after the air terminals and boxes are hung or the location of the light fixtures is known so as to minimize flexible duct lengths and sharp bends.

C. Provide 3” wide minimum sheetmetal straps for flex duct supports. Bare wire or fabric straps are not acceptable.

3.3 DUCT LEAKAGE TESTING

A. Randomly test 10% of all duct systems for leakage in accordance with Section 4 of SMACNA HVAC Air Duct Leakage Test Manual. If leakage test results exceed SMACNA’s allowable leakage rates, then entire duct systems shall be tested.

B. The duct system shall be tested in sections at a static pressure equal to or greater than the highest static pressure duct classification contained in the system.

C. Leakage test pressure and allowable leakage (including exhaust ducts):
   1. Medium pressure ducts: Test pressure 4 inches, allowable leakage shall not exceed 3% of total air quantity of duct being tested.
   2. Low pressure ducts: Test pressure 2 inches, allowable leakage shall not exceed 3% of total air quantity of duct being tested.

3.4 FIRE, SMOKE, FIRE AND SMOKE DAMPERS

A. Install fire, smoke, and fire and smoke dampers in accordance with local code requirements and with the manufacturer’s instructions to conform to the installation used for the rating test.

3.5 CONTROL DAMPER INSTALLATION

A. Assemble multiple section dampers with required interconnecting linkage and extend number of shafts through duct for external mounting of damper motors.

3.6 AIR FLOW MEASURING STATIONS

A. Install units where shown with minimum straight run distances, upstream and downstream as recommended by the manufacturer.

3.7 ACOUSTICAL APPARATUS CASING

A. Panels shall be installed in strict accordance with the manufacturer's installation instructions and as herein specified.

B. Panels shall be secured with an acrylic adhesive/sealant applied between the panel and each support channel and with screws installed around the panel perimeter. Screw spacing shall not be greater than nine (9) inches. Screws shall be stainless steel and shall have a stainless steel washer and sealant gasket.

C. Seal all joints and seams air and water tight.

D. Fill void in panel joints with acoustic fill.

3.8 PROTECTION AND CLEANING

A. Adequately protect material against physical damage. Protect material and ducts during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting. When new ducts are connected to existing ductwork, clean both new and existing ductwork inside and outside before operation. Clean ducts shall be free of all foreign matter including oil and other residue.

3.9 DUCT LEAKAGE REPAIR

A. Repair all audible leaks.

B. All leaks shall be repaired until acceptable rates are achieved.

3.10 SCHEDULE OF MATERIALS

AIR SYSTEM	MATERIAL
Systems with VAV or Constant Volume Terminal Units:	
Supply duct from air handling unit to terminal unit	First fifteen feet of duct from unit shall be lined sheet metal; thereafter, externally insulated sheet metal. Duct shall be medium pressure construction
Supply duct downstream of terminal units	Lined sheet metal, low pressure construction
Systems Without Terminal Units:	
Supply duct	First fifteen feet of duct from unit shall be lined sheet metal; thereafter, externally insulated sheet metal. Duct shall be low pressure construction.

General:

Return air ducts	Lined sheet metal, low pressure construction
Transfer air ducts	Lined sheet metal, low pressure construction.
Outside air ducts	Externally insulated sheet metal, low pressure construction
General exhaust ductwork	Unlined, uninsulated sheet metal, low pressure construction
Dishwasher exhaust ducts	Unlined, uninsulated Type 304 stainless steel. Make all joints in bottom of horizontal runs watertight. Slope horizontal runs to exhaust inlet. Refer to paragraph 2.1 this Section for additional requirements.
Grease-laden exhaust system	Comply with NFPA 96 and 2003 IBC. Refer to paragraph 2.1 this Section for additional requirements.

END OF SECTION

SECTION 233400 - FANS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. In-Line Centrifugal Fans.

1.2 QUALITY ASSURANCE

A. Fans shall be tested and rated in accordance with AMCA requirements for both sound and air flow performance.

B. Fans shall bear AMCA rating seals for both sound and air flow performance.

1.3 SUBMITTALS

A. Submit product data including dimensional data, material specifications, capacity data and installation procedures.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

A. In-Line Centrifugal Fans (small fans):
   1. Acme.
   2. Breidert.
   3. Cook.
   4. Greenheck.
   5. Penn.
   6. Twin City.

2.2 IN-LINE CENTRIFUGAL FANS (SQUARE)

A. Fans shall be direct driven or belt driven as scheduled.

B. Casing shall be fabricated of heavy gauge galvanized steel and shall have a hinged panel to allow service of the fan and drive assembly without dismantling the fan. The casing shall be of bolted construction with corrosion resistant fasteners. The cabinet shall be 18 gauge galvanized steel with a baked polyester powder coating (or acceptable substitute coating). Coating must exceed 1000 hour salt spray test under ASTM 117 test method. Provide an access door with heavy duty closed cell neoprene gasketing. Fan housing shall be internally lined with 1/2-inch thick fiberglass insulation. Housing shall have collars for duct connections.

C. Fans shall be furnished with a pre-wired, built-in disconnect switch. (Direct drive units shall have speed controls mounted on the fan housing.)

D. Fans wheels shall be backward inclined centrifugal type statically and dynamically balanced. Fan shall have a spun Venturi inlet.

E. Belts shall be oil and heat resistant, non-static type.

F. Motors shall be self-cooled with air from outside the duct system. Direct drive unit motors shall be located in a compartment separate from the exhaust air stream. Belt driven units shall have drives sized for 150% of the motor nameplate rating and adjustable sheaves. Fan bearings shall be pillow block cast iron regreasable bearings, selected for a minimum L50 life in excess of 200,000 hours.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Provide flexible connections at inlet and outlet for all fans except grease hood exhaust and wall or roof mounted propeller fans.

END OF SECTION

SECTION 233616 - AIR TERMINAL UNITS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Fan Induction Terminal Units.

B. Single Duct VAV Terminal Units.

1.2 QUALITY ASSURANCE

A. Variable volume terminal units shall be tested and rated in accordance with ARI Standard 880.

B. Insulation shall have UL or E.T.L. approval meeting NFPA 90A.

C. Electric Heating Coils shall include all safety devices as approved by UL or E.T.L.

1.3 SUBMITTALS

A. Submit products data showing unit sizes, inlet and discharge information, scheduled air volume and box pressure drops.

B. Submit sound power levels in decibels re 10^{-12}W in each octave band for discharge and casing radiation.

C. Submit heating capacity, motor data and sound attenuator data.

D. Submit dimensional data (include attenuator dimensions if attenuators are furnished).

E. Submit manufacturer's installation instructions and maintenance and operating procedures.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

A. Air Devices, Inc.

B. Anemostat.

C. Carnes.

D. Carrier.

E. Environmental Technologies.

F. Krueger.

G. Metalaire.

H. Nailor.

I. Price.

J. Titus.

K. Trane.

L. Tempmaster.

M. Tuttle & Bailey.

2.2 PERFORMANCE

A. Terminal units shall be of sized and capacities scheduled on the Drawings.

B. The terminal unit shall be designed to maintain essentially constant primary air flow regardless of inlet duct connection configuration or upstream duct static pressure fluctuations. A hard duct elbow connected at an angle up to 90 degrees to assembly shall not alter the maximum or the minimum factory air flow setting by more than plus or minus 5%.

2.3 FAN POWERED TERMINAL UNITS

A. Casing: Casing shall be factory fabricated of not lighter than 22-gauge, zinc coated steel. Casing shall be internally insulated with a minimum of 1/2-inch thick, 1-1/2 lb. density fiberglass with no raw or exposed edges. The surface of the insulation shall be treated to prevent erosion and shall conform to UL Test 181 and meet NFPA requirements, certification shall be provided. Air volume dampers, fan, controls and the heater shall be factory assembled into a single cabinet.

B. Fan Assembly: Fans shall be forward curved centrifugal type with direct drive permanent split capacitor type motor. Fan/motor assembly shall be isolated from the casing to minimize vibration transmission. The fan section shall have a backdraft damper securely mounted and have a maximum leakage of 2% at a two-inch pressure differential.

C. Air Volume Damper: Control damper shall be located inside the unit casing and shall be constructed of extruded aluminum or galvanized steel components. The control damper shall be designed to provide linear control throughout its operating range. Control damper shall seal against the gasketed stops and total leakage of the casing and damper shall not exceed 5% at three-inch inlet static pressure.

2.4 SINGLE DUCT VAV TERMINAL UNITS

A. Casing: Casing shall be factory fabricated of not lighter than 22-gauge, zinc coated steel. Casing shall be internally insulated with a minimum of 1/2-inch thick 1-1/2 lb. density fiberglass with no raw or exposed edges. The surface of the insulation shall be treated to prevent erosion and shall conform to UL Test 181 and meet NFPA requirements, certification to be provided. Terminal units to be provided for use in hospitals shall have insulation that meets all applicable codes. Foil backed insulation will not be allowed.

B. Air Volume Damper: Control damper shall be located inside the unit casing and shall be constructed of extruded aluminum or galvanized steel components. The control damper shall be designed to provide linear control throughout its operating range. Control shall be proportional to the actuator movement regardless of the valve opening. Control damper shall seal against the gasketed stops and total leakage of the casing and damper shall not exceed 5% at three-inch inlet static pressure.

2.5 ELECTRIC COILS

A. Open type 80% nickel, 20% chromium wire.

B. Insulated by ceramic bushings and supported in a galvanized steel frame with intermediate supports 4-inch on center.

C. Integral control panel with primary and secondary overtemperature protections, fuses, airflow switch, control transformer and step controls.

2.6 ELECTRONIC CONTROLS

A. Electronic controls will be furnished as work of Section 230923 DDC System.

2.7 ELECTRICAL

A. Furnish with 24V transformer for control power on all fan powered and single duct terminal units.

B. Terminal units when supplied to the site shall be suitable for a single power connection.

C. Provide enclosures for control devices and power transformer.

2.8 WIRING

A. Provide 120V to 24V transformer for control power.

B. Terminal units when supplied to the site shall be suitable for a single power connection.

C. Provide enclosures for control devices and power transformer.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer’s instructions and as shown on the Drawings.

B. Terminal unit manufacturer’s flow charts and instructions for field balancing shall be attached to each unit.

C. Terminal units shall have flow measuring taps installed by the unit manufacturer.

D. Provide temporary filters on all fan powered terminal units for use during construction. Remove filters prior to building occupancy.

END OF SECTION

SECTION 233713 - AIR DISTRIBUTION DEVICES

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Supply, Return, Transfer and Exhaust Air Devices and Accessories.

1.2 SUBMITTALS

A. Submit in accordance with Section 230500.

B. Submit product data and shop drawings covering each item together with schedule of outlets, listing CFM, neck velocity, NC level and Ak factor and air flow measurement procedures.

C. Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

A. Manufacturer shall perform air flow test and sound level measurements for the products specified.

B. Manufacturer shall certify cataloged performance and ensure correct application of air outlet types.

1.4 JOB CONDITIONS

A. Review requirements of outlets as to size, finish, and type of mounting prior to submitting shop drawings and schedules of outlets.

B. Check location of outlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

A. Carnes.

B. Hart & Cooley.

C. Krueger.

D. Metal Aire.

E. Nailor

F. Price.

G. Titus.

H. Tuttle & Bailey

I. Greenheck

2.2 GENERAL REQUIREMENTS

A. Provide air devices equal in all respects to those scheduled on the drawings.

B. All air devices shall be the product of one manufacturer.

C. Rate units in accordance with ASHRAE standards.

D. Base air outlet application on space noise level of NC 35 maximum in all areas.

E. Provide supply outlets with sponge rubber seal around edge.

F. Provide baffles to direct air away from walls, columns, or other obstructions within radius of diffuser operation.

G. Provide plaster frame for diffusers located in plaster surfaces.

H. All devices shall be factory finished.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer’s printed instructions.

B. Paint ductwork visible behind air outlets matt black.

C. Seal square to round adapters air tight to diffusers or grilles using caulking compound suitable for materials and service.

END OF SECTION

SECTION 233750 - AIR INLET AND OUTLET LOUVERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Outside Air Louver.

B. Combustion Air Louver.

C. Exhaust/Relief Air Louver.

1.2 SUBMITTALS

A. Submit manufacturer's product data indicating performance data, louver size, materials, finish, mounting type and accessories.

1.3 QUALITY ASSURANCE

A. Louvers shall be rated in accordance with AMCA Standard 500 for water penetration and louver performance.

B. Louvers shall be rated with ASTM E1996 Missile Level E.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

A. Air Balance Inc.

B. Arrow United.

C. AWV.

D. Greenheck.

E. Louvers & Dampers, Inc.

F. Ruskin.

2.2 FIXED LOUVERS

A. Frame: 6063T5 extruded aluminum .081-inch wall thickness with caulking slots.

B. Blades: 6063T5 extruded aluminum .081-inch wall thickness. Blades at approximately 3-inch centers at 37-1/2 degree angle.

C. Screen: Expanded flattened aluminum bird screen 3/4"x.051” mounted on rear.

D. Finish: Mill

E. Frame: Box (Provide front flange if indicated on drawings).

2.3 COMBINATION LOUVER/DAMPER

A. Frame: 6063T5 extruded aluminum .125-inch wall thickness with caulking slots.

B. Blades: 6063T5 extruded aluminum .081-inch wall thickness. Blades at approximately 4-1/2-inch centers at 37-1/2 degree angle.

C. Adjustable louver section with low leakage blade and jamb seals and operating quadrant.

D. Electric adjustable louver operator bracket and interconnecting linkage to be factory supplied. Motor to be 115v/1 PH and shall fail closed.

E. Screen: Expanded flattened aluminum bird screen 3/4"x.051” mounted on rear.

F. Finish: Mill

G. Frame: Box channel type with front flange.

PART 3– EXECUTION

3.1 INSTALLATION

A. Fasten box frame to construction with bolts through clip angles.

B. Caulk around frame for weather tight perimeter.

END OF SECTION

SECTION 236213 - AIR COOLED CONDENSING UNITS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Factory Built Condensing Unit Package.

B. Internal Piping and Accessories.

C. Controls.

1.2 SUBMITTALS

A. Submit manufacturer's product data including:
   1. Dimensional data.
   2. Cross plot of condenser with its associated evaporator showing sensible and total capacities at scheduled conditions.
   3. Electrical power and control wiring diagrams.
   4. Electrical characteristics.
   5. Installation instructions.
   6. Piping connection location and sizes.
   7. Maintenance and operating manuals.

1.3 QUALITY ASSURANCE

A. Conform to requirements of UL and applicable codes.

B. Test and rate cooling systems to ARI Standard 210.

1.4 WARRANTY

A. Provide a warranty covering all parts and labor for one year from date of start-up. Compressors shall have minimum warranty of five years from date of start-up.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to specifications Section 230500 for additional requirements.

A. Carrier.

B. Lennox.

C. Daikin.

D. Trane.

E. Aaon.

F. York.

2.2 TYPE AND PERFORMANCE

A. Provide self-contained, package, factory assembled and prewired units suitable for outdoor use consisting of cabinet, compressor, condensing coil, integral subcooling coil, fans, controls, liquid receiver and screens.

B. The condensing unit and associated air handling unit shall be the product of one manufacturer and shall meet or exceed the capacity scheduled on the drawings.

2.3 MATERIALS

A. Use corrosion resistant materials for parts in contact with refrigerant.

2.4 CABINET

A. Galvanized steel with baked enamel finish and removable access doors or panels with quick fasteners.

B. Provide factory hail guards.

2.5 COMPRESSOR

A. Compressors shall be hermetic or semi-hermetic with positive lubrication, crankcase heater, capacity modulation, motor overload protection, service valves and filter drier. Hermetic compressors shall be installed on rubber mounts. Semi-hermetic compressors shall be spring isolated.

2.6 CONDENSER

A. Coil: Seamless copper tubing with aluminum fins. Aluminum tube/aluminum fin coils are acceptable for units up to nominal 5-ton capacity.

B. Fans: Vertical discharge direct drive propeller fans resiliently mounted with guard and motor.

C. Motors: Permanently lubricated ball bearing motors with built-in current and overload protection, UL listed for outdoor use.

2.7 CONTROLS

A. Controls shall be mounted in a control panel.

B. Provide 24-volt transformer for controls as required.

C. Provide high and low pressure cutouts for compressor oil pressure control, nonrecycling pump-down and reset relay.

D. Provide controls to permit operation down to 0 degrees F. ambient temperature at minimum compressor load.

E. Provide timer circuits to prevent rapid loading and unloading of compressor.

PART 3– EXECUTION

3.1 INSTALLATION

A. Provide mechanical and electrical connections in accordance with manufacturer's installation instructions.

B. Furnish charge of refrigerant and oil.

C. Provide liquid sight glass.

3.2 START-UP AND TESTING

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.

B. Test entire refrigeration piping system for leaks and repair leaks.

C. Shut-down system if initial start-up and testing take place in winter and machines are to remain inoperative. Repeat start-up and testing operating at beginning of first cooling season.

D. Provide cooling season start-up and winter season shut-down for first year of operation.

END OF SECTION

SECTION 237413 - AIR HANDLING UNITS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Factory Built Air Handling Unit.

1.2 SUBMITTALS

A. Submit manufacturer's product data including the following:
   1. Dimensional data and weights.
   2. Materials and methods of construction.
   3. Fan performance curves with operating point plotted.
   4. Coil computer selection calculations.
   5. Motor data.
   6. Discharge and radiated sound power levels.

1.3 QUALITY ASSURANCE

A. All units shall be tested, rated and certified as complete units in accordance with ARI Standard 430, and shall bear the ARI seal.

B. Rooftop air handling units shall be specifically designed and manufactured for rooftop mounting.

C. Coil performance shall be tested, rated and certified in accordance with ARI Standard 410, and shall bear the ARI seal.

D. Coils shall be tested under water with compressed air to 325 psig.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

Refer to Specifications Section 230500 for additional requirements.

A. Carrier.

B. Daikin.

C. Temtrol.

D. Trane.

E. York.

F. Aaon.

2.2 APPARATUS CASING

A. The unit shall be an assembly of sections having the same casing construction.

B. The unit structural frame shall be constructed of steel and structurally reinforced for rigidity.

C. The entire unit shall be minimum two inch, double wall construction. Casing panels shall be fabricated of G-90 galvanized steel with reinforcement to prevent pulsation and bulging. The casing shall be designed and constructed to withstand the pressures required by the system but not less than ±6-inch static pressure.

D. Panels shall have a galvanized steel exterior skin, shall be internally insulated with minimum 1.5 lb/cf glass fiber insulation and shall have a solid galvanized steel inner lining. Caulk casing panels airtight. Insulation shall be secured with 100% coverage of adhesive. All insulation products shall meet ASTM E-84, NFPA 90A and UL requirements. Insulation installation shall be adequate to prevent condensation on the outside of the casing. Mount panels to the frame using neoprene gaskets and rubber washered, nickel plated or stainless steel screws.

E. Casing shall completely enclose all components.

F. The unit shall have a structural base with cross members adequate to support all unit components. The unit floor shall consist of a galvanized steel outer panel, 3 inches of glass fiber insulation and galvanized steel inner panel.

G. Drain pans shall extend completely under the coil section and shall have minimum 1-1/4-inch threaded drain connections. Drain pans shall be sealed double wall steel construction with rigid glass fiber insulation and Type 316 stainless steel inner pan. Drain pans shall drain completely.

H. Access doors shall be hinged, double wall insulated type with gasket seals and camlock latches. Provide doors on the drive side of fan sections, in coil sections and in side access filter sections. Access doors shall be as close as possible in size to the height and width of the section in which they are installed.

2.3 FAN SECTION

A. Fan section shall have a channel base with structural steel supports for the fan, motor and drive assembly.

B. Internally isolated units shall have the fan motor and drive factory mounted on a structural steel base with 2-inch deflection springs and shall have fan discharge flexible connector and thrust restraint springs.

C. Externally isolated units shall have springs sized by the air handling unit manufacturer and provided with the unit for field installation. Isolators and flexible piping and duct connections shall comply with Section 230548.

D. Fans shall be double width, double inlet centrifugal type with forward curved, backward inclined or airfoil wheels as scheduled. Wheels shall be steel galvanized or primed and finished with baked enamel coating.

E. Fans shafts shall be solid steel ground and polished. Wheels shall be keyed to the shaft and designed for continuous operation at the maximum rated speed and horsepower. Fan wheels and shafts shall be selected at a minimum of 25% below the first critical speed.

F. The rotating assembly shall be statically and dynamically balanced at the factory. Refer to Section 23 05 00 for minimum acceptable vibration criteria. Equipment not meeting this criteria will be repaired or replaced at no cost to the Owner.

G. Bearings shall be self-aligning, greasable, pillow black ball or roller bearings with lubrication fittings extended to the drive side and located within the casing or flange type bearings. Bearings shall have an average life of 200,000 hours at design conditions in accordance with ANSI B3.15.

H. Motors shall be totally enclosed air over type in accordance with Section 23 05 13. Motor speed shall not exceed 1750 RPM. Factory mount motors on adjustable slide rails.

I. On units with variable frequency drives and externally mounted motor provide acoustically lined motor enclosure with adequate positive ventilation.

J. Whenever variable frequency PWM drives are installed to control AC motors, a maintenance-free, circumferential, conductive microfiber shaft grounding ring (SGR) shall be installed on the AC motor to discharge shaft currents to ground. Grounding ring shall be similar to that manufactured by AEGIS®SGR. Device to be installed per manufacturers recommendations.

K. Total static calculation on unit shall include both clean and dirty filter allowances to select the fan and motor. These allowances are not accounted for in the external static pressure losses scheduled.

2.4 COIL SECTION

A. Coils shall have galvanized steel casings with intermediate tube sheets 48 inches on center maximum. Stacked coils shall have galvanized steel intermediate drain pans with copper downspouts extended to main drain pan.

B. Coil frames shall not be a part of the air handling unit structural frame.

C. Coils shall be removable without affecting the structural integrity of the air handling unit casing.

D. Coil inlet and outlet connections shall be threaded and shall be on the same side of the unit. Copper connections shall have wrench flats.

E. Refrigerant Coils:
   1. Minimum 1/2 inch O.D. copper tubes with mechanically bonded plate or spiral aluminum fins.
   2. Copper solder type connections.
   3. Minimum of two pressure type distributors.
   4. Intertwined face split circuiting.
   5. Dehydrated and charged with dry nitrogen.
   6. Maximum 10 fins/inch.

F. Electric Coils:
   1. Open type 80% nickel, 20% chromium wire.
   2. Insulated by ceramic bushings and supported in a galvanized steel frame with intermediate supports 4-inch on center.
   3. Integral control panel with primary and secondary overtemperture protection, fuses, airflow switch, control transformer and step controls.

2.5 FILTER SECTION: REFER TO SECTION 23 41 00.

2.6 DAMPER SECTION

A. Mixing box or combination filter mixing box sections shall have interconnected parallel blade outside air and return air dampers.

B. Exhaust air sections shall be provided between the return air fan and mixing box.

C. Face and bypass dampers shall have parallel blade dampers interconnected to operate in opposite directions.

D. Multi-zone dampers shall have hot and cold deck damper blades secured to the vertical shaft 90 degrees apart. Zone damper casing shall be double wall insulated construction.

E. Dampers shall be constructed of maximum 8-inch wide galvanized steel blades with steel shafts supported by nylon bushings mounted in galvanized steel rigid frame. Sectionalize damper assembly to limit blade length to 50 inches maximum. Dampers shall be low leakage type with blade and edge seals. Leakage shall not exceed 1.0 CFM/sq.ft at 1.0 in.w.g. differential pressure.

2.7 ACCESS SECTIONS

A. Provide minimum 18-inch wide access sections with full height hinged doors on both sides.

PART 3– EXECUTION

3.1 INSTALLATION

A. Replace sheaves as required for final balancing.

B. Provide filters to protect units during construction. Replace filters at time of final acceptance.

C. Indoor Units:
   1. Mount units on concrete housekeeping pads with anchor bolts and secure in place.
   2. Install ducts and piping to facilitate coil and filter removal and allow access to all sections.

END OF SECTION

SECTION 238239 - ELECTRIC HEATERS

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Baseboard Heater.

B. Electric Unit Heaters.

C. Electric Radiant Ceiling Panels.

1.2 SUBMITTALS

A. Submit manufacturer's dimensional and performance data.

1.3 QUALITY ASSURANCE

A. Electric heaters shall be UL listed.

B. Comply with all requirements of the National Electrical Code and Division 26 of these Specifications.

PART 2– PRODUCTS

2.1 PERFORMANCE

A. Equipment capacity shall meet or exceed that scheduled on the drawings.

2.2 UNIT HEATERS

A. Casing shall be heavy gauge steel with baked enamel finish. Provide threaded connections for hanger rods.

B. Elements shall be high mass, all steel, tubular finned type.

C. Fan shall be direct drive propeller type, statically and dynamically balanced with grease lubricated ball bearings.

D. Air outlet shall be adjustable pattern diffuser on projection models and four-way louvers on horizontal throw models.

2.3 SAFETY DEVICES AND CONTROL

A. Provide manual reset thermal overload fuses and all other required safety devices.

B. Unit shall be provided with an integral thermostat.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install unit in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 239000 - TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Testing, Adjusting and Balancing of the following systems:
   1. Air Systems.
   2. Hydronic Systems.
   3. Refrigeration Systems.
   4. Steam Systems.

B. Combustion Testing.

C. Sound and Vibration Testing.

1.2 APPROVED TEST AND BALANCE CONTRACTORS

A. Engineered Air Balance.

B. P.H.I. Service Agency, Inc.

C. Testing Specialties Inc.

D. T.R.M.

E. Professional Engineer Balancing Lab

F. Pro-Tab Services

1.3 SUBMITTALS

A. Submit qualifications and certification of personnel within 30 days after the award of the Contract.

B. Submit proposed testing and balancing procedures with sample forms for each system for approval prior to testing.

C. Specific procedures used in all tests shall be included in the test report. Contractor shall identify all equipment by the identification code as shown on the drawings.

D. Submit a complete test report certified correct by an officer of the Testing Adjusting and Balancing Agency. The report shall be bound and shall contain the following:
   1. Title Page.
   2. Certificate verifying that the testing and balancing has been done in accordance with the specifications and the results achieved are correct.
   3. System diagrams.
   4. Recommended testing procedures.
   5. Test reports for systems and equipment on AABC or NEBB standard forms.
   6. Instrument calibration reports.
   7. Control system verification report.

E. Summary of unresolved or unsatisfactory conditions.

1.4 QUALITY ASSURANCE

A. All testing and balancing shall be done by an independent Test and Balance Agency that specializes in the testing and balancing of heating, ventilating and air conditioning systems. The firm shall not be affiliated with the Contractor or equipment supplier.

B. The Test and Balance Firm shall be certified by AABC or NEBB to perform air, hydronics, sound and vibration measurements.

C. All work shall be done under the direct supervision of a Test and Balance Supervisor, who is certified by AABC or NEBB to perform air, hydronics, sound and vibration measurements. If requested, the test shall be conducted in the presence of the Engineer.

D. The environmental systems including all equipment, apparatus and distribution systems shall be tested, adjusted and balanced in accordance with the latest edition of the NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems or the AABC National Standards except where superseded by these specifications.

E. Instruments used in all HVAC systems and equipment tests shall be as recommended by the AABC, AMCA, ASHRAE, NEBB, or as approved by the Engineer. Test instruments used shall be initially checked and periodically checked thereafter to verify their calibration accuracy. Verification of the calibration of each instrument required for a test is to be provided with each test report.

F. All test equipment shall be furnished by the Contractor and shall remain his property.

1.5 WARRANTY

A. The Test and Balance Agency shall include an extended warranty of 90 days, after final acceptance of the project, during which time the Engineer at his discretion may request a recheck or resetting of any item listed in test report. The firm shall provide technicians to assist the Engineer in making any test he may require during this period of time.

PART 2– PRODUCTS

2.1 Not applicable for this section

PART 3– EXECUTION

3.1 EXAMINATION

A. The Contractor shall provide to the Test and Balance Agency one (1) set of approved shop drawings on all equipment which will be tested and balanced.

B. The Contractor shall provide all thermometer wells, gauge cocks and test ports required to perform the testing and balancing work.

C. The Test and Balance Supervisor shall review the HVAC design drawings and shop drawings prior to fabrication and installation of the HVAC systems to ensure that all of the necessary balancing dampers, valves, test ports, etc. required to test and balance the systems are provided.

D. The Test and Balance Supervisor shall be kept informed during the construction of the project of major changes made to the HVAC system.

E. The Test and Balance Supervisor will make periodic inspections during construction to familiarize himself with the project and submit a written report to the Engineer of each visit.

3.2 PREPARATION

A. Put all equipment into full operation and continue its operation during each working day of testing and balancing. No test and balancing work shall start until all of the air handling equipment has new filters installed and coils and strainers have been cleaned.

3.3 TESTING, ADJUSTING AND BALANCING

A. Perform all work in accordance with approved testing and balancing procedures published by AABC or NEBB that have been approved by the Engineer.

B. Test, adjust and balance the following systems and all associated equipment.
   1. Supply Air.
   2. Return Air.
   3. Outside Air.
   4. Exhaust Air.
   5. Relief Air.
   6. Domestic Hot Water Recirculation.

C. Test, adjust and balance all air and hydronic systems and individual components to within -0% to +10% of the values shown on the drawings.

D. Perform pitot traverse measurements of all main and sub-main ducts.

E. Test, adjust and balance all fume hoods and exhaust hoods including face velocities.

F. Change drives if necessary to accomplish proper air flow at no additional cost to the Owner.

G. Calibrate, set and adjust all automatic temperature controls. Coordinate Test and Balance functions with the Controls Contractor.

H. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks damper sequences, air and water resets, high- and low-limit stats, etc.

I. Cycle through all safety devices and circuits to verify correct operation.

J. Verify correct electric power supply voltage and trip settings on various overload devices.

K. After Owner Occupancy: After Owner has occupied and using the building, make three additional inspections of the system (at one-month intervals) to:
   1. Correct any Owner-observed temperature imbalance.
   2. Check correct operation of equipment and verify by letter to the Engineer on each trip. List in the letter corrections made.

END OF SECTION

SECTION 260500 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. The work covered by the Electrical Sections of the Specifications includes the furnishing of all materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of all electrical work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide an installation complete in every respect.

C. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, all details of the work and the working conditions, and verify all dimensions in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit, the coordination of all existing conditions, and the inclusion of all consideration of existing conditions.

1.2 DRAWINGS AND SPECIFICATIONS

A. The Specifications are accompanied by Drawings that indicate the locations of equipment and materials of construction. The Drawings and Specifications are complementary, and what is required by one is as binding as if required by both.

B. Should the Drawings or Specifications be in conflict, the better quality or greater quantity of work or materials shall be provided.

C. Items specifically mentioned in the Specifications but not shown on the Drawings or items shown on the Drawings but not specifically mentioned in the Specifications shall be provided as if they were both specified and shown in the Drawings.

D. Division 26 Specifications are written in imperative and streamlined format. This imperative language is directed to the Contractor. The words "shall be" shall be included by inference where a colon (:) is used within sentences and phrases.

E. Where utilized in these Specifications, the following definitions apply:
   1. Install: To set in place in position for service.
   2. Furnish: To supply.
   3. Provide: To furnish, and set in place for service

1.3 CODES AND STANDARDS

A. Work shall comply with the local city codes and ordinances, the regulations of state authorities having lawful jurisdiction and the codes, statutes and reference standards identified within these Specifications. These Specifications shall not be construed as negating the regulations or requirements of lawful jurisdictions.

B. Where Specifications require materials or equipment exceeding the minimum requirements of applicable codes and ordinances, the requirements of these Specifications shall take precedence.

1.4 UTILITIES

A. The Contract Documents reflect the general location and routing of utilities required for this project. Visit the site, and coordinate and confirm the exact requirements with the serving utilities, including electric, telephone, cable and other as included in the Contract. Refer to Division 1.

B. The Contractor shall provide underground concrete encased primary electrical conduits from the utility riser pole or underground vault to the utility transformer in accordance with the standards of the local utility company. Installation methods and materials are intentionally not detailed on construction drawings. It shall be the responsibility of the Contractor to consult with the local utility company to determine the required conduit sizes, conduit quantity and construction methods. The Contractor shall schedule and coordinate inspection of the underground primary conduits by the local utility prior to applying concrete encasement.

1.5 TEMPORARY SERVICES

A. Provide temporary electrical service and electric power distribution and temporary lighting throughout the construction site. Install and maintain in accordance with National Electrical Code and OSHA requirements. Make arrangements with the serving utility for point of service for temporary electric service and pay costs for delivery to and use at the site.

1.6 DIGITAL (AUTOCAD) DRAWING FILES

A. If desired by the Contractor, a sub-contractor, or product supplier for use in preparing shop drawings, installation drawings, as-built drawings or other project related documentation, AutoCAD drawing files may be obtained from MS2 Inc. at the cost of One Hundred Fifty Dollars ($150.00) per sheet file.

1.7 RECORD DOCUMENTS

A. Prepare and deliver to the Architect, record documents in accordance with the requirements in Division 1. Drawings shall clearly indicate the following installed conditions:
   1. Raceway system; size and location, of service entrance and feeder conductors, exterior and interior.
   2. Identify and indicate the installed locations of distribution and control equipment.
   3. Identify the branch circuit serving each outlet and each unit of utilization equipment and appliance.
   4. One line diagrams, illustrating the installed configuration of the power distribution system and each supervisory and control system provided under this Division.
   5. Locations and invert elevations of underground installations.
   6. Identify modifications of the original Construction Documents implemented by value engineering, change order, supplemental instruction or other authorized directive.

1.8 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. General: It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The Electrical Drawings are diagrammatic in nature and do not show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of all codes and ordinances as well as all structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate

conduit hangers shall be set before concrete is poured, and proper openings through floors, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of electrical items is indicated on the Electrical Drawings. Exact locations are to be determined by actual field measurements and will in all cases be subject to the approval of the Architect/Engineer. The Architect/Engineer reserves the right to make any reasonable changes in the indicated locations prior to installation at no additional cost.

PART 2– PRODUCTS

2.1 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Materials and equipment shall conform to National Electrical Code requirements and shall be listed by Underwriters Laboratories, Inc. (UL). UL listing will be accepted as evidence that the material or equipment conform to the standards of that agency. In lieu of this listing, submit a statement from a nationally recognized testing agency, indicating that products have been tested in accordance with UL criteria and that the materials and equipment comply with Contract requirements.

2.2 STANDARD PRODUCTS

A. Materials and equipment: Standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these Specifications, and essential duplicates of materials and equipment that have been in satisfactory use at least two (2) years prior to the date of receipt of bids. Custom fabricated items shall be fully described using Drawings and technical data sufficient to demonstrate compliance with the Contract Documents.

2.3 MANUFACTURER'S INSTRUCTIONS

A. Install materials and equipment in accordance with these Specifications and the manufacturer's recommendations and instructions. Request advice and supervisory assistance from equipment manufacturers as required to ensure proper installation, operation, and start-up of equipment. Notify the Architect/Engineer in writing of conflicts between the Contract Documents and the manufacturer's recommendations prior to proceeding with the work.

2.4 RUST PREVENTION

A. Protect ferrous metallic materials against corrosion. Provide ferrous metallic equipment and component parts with factory applied rust inhibiting treatment and painted, hot dip galvanized, electro-galvanized or equivalent rust inhibiting finish. Reference individual Division 26 sections for specific requirements pertaining to equipment and materials specified herein.

2.5 STORAGE AT SITE

A. Do not receive material or equipment at the site until ready for installation or unit suitable space is provided to properly protect equipment from the elements and physical damage.

2.6 CONDITION OF MATERIALS AND APPURTENANCES

A. Materials shall be new and unused. Material and equipment damaged in transit, during delivery to premises, while in storage, while being erected and installed, or while being tested, prior to final acceptance, shall be removed and acceptable material installed in place thereof.

2.7 NAMEPLATES

A. Provide factory assembled equipment with nameplates securely attached to the equipment. Nameplates shall include identification of product catalog number, serial number, style number, manufacturer's name and address.

B. Provide identification of equipment and component materials as specified in Section 260553.

PART 3– EXECUTION

3.1 SPACE AND EQUIPMENT ARRANGEMENT

A. Install equipment and components in a manner to permit access to parts requiring service, and to permit removal for service without disassembly of adjacent equipment.

B. Install equipment too large to permit access through stairways, doorways, or shafts prior to enclosing the structure.

C. Completed installation shall provide minimum working clearances as required by NEC.

3.2 SUBMITTAL AND REVIEW OF MATERIALS

A. Submittal Time: Within the time period and in quantity specified in Division 1, submit Shop Drawings and technical data as required by the individual specification sections.

B. Manner of Submittal: Submit product data and Shop Drawings at one time in three ring, hard back binder(s). Partial submittals will not be accepted unless approved by the Architect. Submittal format shall follow the specification format, with each specification section having a section divider and with equipment and materials referenced to the particular paragraph(s) of the Specifications.

C. Submittals: Indicate on the front cover or the cover sheet of each binder the following: The title of the submittal; the name and location of the project; the names of the Architect and Engineer; Contractor's name; and the date of the submittal.
   1. Arrangement of Items: Subdivide items according to specification sections, with each section having a divider with tab clearly denoting the section and referencing the appropriate paragraphs of the Specifications. Index as follows:
      a. General Index: Located behind the title sheet indexing the entire submittal by section (divider).
      b. Section Index: Located at each section divider, identifying included item.
   2. Manufacturer's Data: Descriptive literature, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Manufacturer's name, trade name, catalog or model, nameplate data, physical dimensions, specification references, applicable industry, and other information necessary to establish Contract compliance.
   3. Shop Drawings: Shop Drawings indicating types, sizes, accessories, elevations, floor plans, sectional views, installation details, elementary diagrams, and wiring diagrams as necessary to demonstrate compliance. Wiring diagrams shall identify circuit terminals and the internal wiring for each item of equipment and the interconnection between the items. Drawings shall also indicate adequate NEC working clearance and access to the working space.

D. Compliance Statement: Include with each submittal, a signed compliance statement as required by Division 1.

E. Substitutions: Refer to Division 1.
   1. Lighting Fixture Substitutions shall include photometrics.

F. Submittal Processing Time: In accordance with Division 1.

G. Quantity of Submittals: In accordance with Division 1.

H. Submittal Review:
   1. Review and comment is performed for general compliance with the intent of the Contract Documents. Review and comments do not relieve the Contractor of the responsibility of compliance with the requirements of the Contract Documents.
   2. The omission of any specified or reasonably implied characteristic, function, capacity, or component, on any item submitted, is inferred to indicate, by virtue of the Contractor's compliance statement, that the item complies with the intent of the Contract Documents.
   3. The Architect/Engineer reserves the right to require submittal information, including samples, as considered necessary to accomplish review.
   4. The Architect/Engineer reserves the right to reject any item or material, because of deceptive submittal material, and to require that any item found by field observation to be deficient in the represented characteristics, capacity and function, be removed from the site and that specified items be provided.

I. Owner's Records: Submit for the Owners records two (2) sets of complete "Final Review" submittals prior to final project acceptance.

J. Spare Parts Data: Prior to final acceptance, furnish spare parts data for installed equipment. Include a complete list of parts and supplies, including the manufacturer's recommended items to be purchased as spare parts, with current unit prices and sources of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the Contract.

3.3 CUTTING AND PATCHING: Refer to Division 1.

3.4 CLEANING: Refer to Division 1.

3.5 CONDUIT SLEEVES

A. Provide galvanized steel sleeves where conduits pass through walls or floors not on fill, and seal to prevent air and noise transmission. In walls, install flush with each finished surface; in floor slabs, extend not more that 1-1/2 inch above floor slab and sealed water-tight. Size sleeves at least 1/2-inch greater than the outside diameter of the conduit.

B. At exterior walls galvanized steel sleeves having an inside diameter at least 2-inches greater than the outside diameter of contained conduit. Install sleeves in a manner to maintain the intended integrity of the wall. Seal annular space between pipe and sleeve water-tight.

C. In exterior walls located below finished grade, provide water-tight sleeve protection as specified in Section 260500.

3.6 HOUSEKEEPING PADS

A. Provide concrete house keeping pads, pinned to floor or monolithic poured with structure, for each floor mounted switchboard, motor control center, and transformer. Construct pad of minimum 2000psi concrete, reinforced using #6 wire mesh. Pad height, minimum 3-1/2 inches above finished floor. Pad length and width of dimensions equal to or greater than the foot print of the supported equipment.

3.7 PRECEDENCE OF WORK

A. Observe the following order of precedence for the installation of materials and equipment.
   1. Structural members.
   2. Soil and drain piping.
   3. Vent piping.
   4. Refrigerant piping.
   5. Steam piping.
   6. Condensate piping.
   7. Electrical bus duct.
   8. Supply ductwork.
   9. Exhaust ductwork.
   10. Circulating water piping (heating/cooling).
   11. Domestic hot and cold water piping.
   12. Natural gas piping.
   13. Fire protection piping.
   14. Electrical conduit.

3.8 ELECTRIC WIRING OF MOTORS, HVAC CONTROL SYSTEMS AND EQUIPMENT

A. The work of Division 26 includes:
   1. Installation and power wiring of individually mounted motor controllers furnished under other Divisions.
   2. Power wiring for individually mounted and group mounted motor controllers furnished and installed under Division 26.
   3. Power wiring of motor controllers provided integral with equipment furnished under Division 26 and other Divisions.
   4. Power and control wiring, of any voltage, of systems specified in Division 26.

B. The work of Division 26 does not include:
   1. Control wiring associated with HVAC/EMCS control systems, including that which interfaces with fire detection and alarm systems, and motor control
   2. Power wiring for HVAC control system control panels and components. Power wiring for this equipment is provided by Division 23.
   3. Remote control devices associated with HVAC/EMCS controller systems which interface with and execute control of motor control equipment.

3.9 OUTAGES

A. Outages of services as required by the project will be permitted, but only at a time approved by the Owner. The Contractor shall notify the Owner in writing two (2) weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All cost of outages, including overtime charges, shall be included in the Contract amount.

3.10 OPERATING AND MAINTENANCE MANUAL

A. Furnish two (2) copies of bound, indexed operating and maintenance manuals with complete technical data for each electrical system. Deliver to the Architect prior to the time that system and equipment acceptance tests are performed. Include the following information:
   1. Manufacturer's installation instructions.
   2. Manufacturer's local representative and/or distributor's name and address.
   3. Manufacturer's operating and maintenance instructions.
   4. Manufacturer's internal wiring diagrams.
   5. Contractor's installation wiring diagrams.

6. Control system installation wiring diagrams.
7. Control system installation Drawings.
8. Replacement part number listings and descriptions.
9. Framed operating instructions when required in individual specification sections.
10. A framed final electrical distribution one line diagram.
11. Warranties and guarantees.
12. Systems Certifications required by individual specification sections.

3.11 TESTS

A. Perform system testing, verification and demonstration and provide Owner instruction in maintenance and operation as specified within each individual Specification section.

3.12 VIBRATION ISOLATION

A. Provide vibration isolation means for equipment and materials to prevent the transmission of perceptible vibration, structure borne or air borne noise. Items requiring vibration isolation include:
   1. Switchgear, motor control centers, motor starter panelboards, motors, transformers and rotating and reciprocating equipment shall be mounted on cork, rubber or steel spring isolator units properly sized, spaced and loaded as recommended by manufacturer.
   2. Electrical Conduit: Isolate from dry type transformers, rotating and reciprocating machinery using flexible conduit, 18-inches minimum length or 12-inches of flexible conduit per 1-inch of conduit diameter with maximum of 36-inches.

3.13 IDENTIFICATION AND LABELING

A. Disconnect switches, switchgear, motor control centers, panelboards, motor controllers, special purpose device plates, and feeders shall be labeled or marked to identify their service. Provide labeling as follows:
   1. Equipment: Engraved nameplates constructed of laminated phenolic plastic, at least 1/16-inch thick, 3 ply, black surfaces, and white core. Engrave using Condensed Gothic, at least 1/4-inch high. Label nomenclature shall conform to the Schedules and Drawings.
   2. Devices: Identify the equipment served by remote control light switches and equipment control switches by engraving the device cover plate, using 3/16-inch Condensed Gothic, filled with black enamel.
   3. Miscellaneous Plates: Identify special purpose outlets and pilot lights by engraving the device plate using 3/16-inch Condensed Gothic filled with black enamel. Nomenclature shall include the service of the outlet or the indication of the pilot.
   4. Attach labels and plates to equipment using sheet metal or machine screws or pop rivets.

3.14 CONDITIONS OF EQUIPMENT AT FINAL ACCEPTANCE

A. Lighting fixtures and controls are operating as intended, and lenses and reflectors are free of dust, debris, and fingerprints.

B. Conductors within panelboards, switchboards, control centers and control panels are neatly formed, bundled, and made-up tight. Equipment enclosure interiors are vacuum cleaned and exterior surfaces cleaned free of stray paint, dust, grease, and fingerprints. Circuit directories are neatly typed and in place.

C. Wall plates and exposed switch and receptacle parts are clean, free of paint and plaster.

D. Touch-up scratched surfaces using paint matching the factory applied finish. Where paint cannot be matched, the entire surface shall be repainted in a color and manner approved by the Architect.

3.15 GUARANTEE

A. Guarantee materials and workmanship for a period of not less than twelve (12) months or as otherwise required by Division 1 or individual specification sections after the final acceptance of work.

END OF SECTION

SECTION 260519 - WIRE AND CABLE (600 VOLTS AND LESS)

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: Wire and cable, rated 600 volts or less.

B. Related Work: This is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. ASTM B3-01 – Standard Specification for Soft and Annealed Copper Wire.

B. ICEA S-61-402 and S-66-524 – Insulated Cable Engineers Association.

C. NFPA 70-2020 – National Electrical Code (NEC).

D. UL 44, UL 83 and UL 854 – Underwriters Laboratories.

1.3 QUALITY ASSURANCE

A. Manufacturers: Products of manufacturers that have been regularly engaged in the manufacture of wire and cable of the types and sizes required for a minimum of five (5) years.

1.4 SUBMITTALS

A. Submit manufacturer’s technical data, in accordance with the requirements of Section 26 05 00, sufficient to demonstrate compliance with this Specification if proposed products are not products of the manufacturers listed in paragraph 2.1.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Cable.

B. Essex International, Inc.

C. Southwire.

D. Triangle.

E. Encore. (NEISD)

2.2 MATERIALS

A. Copper Conductor: 98 percent conductivity annealed copper in compliance with ASTM B3-01, and Federal Specification A-A-59544. #10 AWG and smaller of solid conductor, and #8 AWG and larger of stranded conductor.

B. Cable Insulation and UL Identification: Permanently marked approximately every 2 feet to indicate size, voltage, insulation type and temperature rating, and in compliance with UL 854 (Moisture and Flame Retardance), UL 44 for XHHW-2 insulation, and UL 84 for THHN or THWN insulation.

C. Provide insulation types for applications as follows:

WIRE AND CABLE INSULATION FOR GENERAL USE		
USE	**TYPE INSULATION**	**UL ICEA**
Dry Locations	THHN-THWN	UL83 S-61-402
Damp or Wet Locations	THHN-THWN or XHHW	UL83 or UL44 S-61-402 or S-66-524
Feeders	THHN-THWN or XHHW	UL83 or UL44 S-61-402 or S-66-524
Service Entrance – Below Grade	XHHW or XLPE	UL44 S-66-524
Service Entrance – Above Grade	THHN-THWN or XHHW	UL83 S-61-402

D. Conduit sizes specified in the Drawings are based upon conduit fill using conductors of the specified sizes having Type THW insulation. Provide the specified conduit sizes regardless of the installation of conductors of smaller overall diameter due to thinner insulation thickness.

E. Control/Communications (Low Voltage) Type Wires and Cables:
1. Provide size, type and materials as required by system specifications and by the system equipment manufacturer.

PART 3– EXECUTION

3.1 INSTALLATION – INSULATED CONDUCTORS

A. Install in raceways, unless otherwise specifically noted.

B. Color Code: Provide for service, feeder, and branch circuit conductors.

208/120V SYSTEMS		**480/277V SYSTEMS**		**ALL SYSTEMS**	
Phase A	Black *	Phase A	Purple *	Equipment Ground	Green
Phase B	Red *	Phase B	Brown *		
Phase C	Blue *	Phase C	Yellow *		
Neutral	White	Neutral	Gray		

* Coordinate exact color code of phase conductors with local code requirements.

Conductors #6 and smaller, color code by means of factory applied, color impregnated insulation. Conductors #4 and larger, color code by means of plastic coated self-sticking markers, colored nylon cable ties, or heat shrink type sleeves.

C. Provide at each outlet, fixture, appliance and equipment location, a minimum of 6-inches free conductor to accommodate, suitable termination. Conductors in outlet boxes not for connection to devices or equipment under this Contract shall be neatly and clearly identified by circuit number, and coiled, with the cut ends insulated and taped together.

D. Minimum Branch Circuit Conductor Sizes:
   1. Branch Circuit Homeruns (See paragraph 3.01.I): Minimum #10 AWG. Exit lighting and emergency wiring circuits shall be #10 AWG minimum throughout branch circuit length.
   2. Conductors for 20 Amp general purpose branch circuits, of 120 volts of greater than 60 feet length, and of 277 volts of greater than 120 feet length to the center of the load, shall be throughout the total circuit length, minimum #10 AWG or larger, as required to limit voltage drop in the circuit to a maximum of 3 percent at branch circuit rated capacity. Conductors for 20 Amp dedicated branch circuits, of 120 volt of greater than 90 feet length and of 277 volt of greater than 200 feet length, shall be, throughout the total circuit length, minimum #10 AWG or larger as required to limit voltage drop in the circuit to a maximum of 3 percent at branch circuit rated capacity.
   3. Class 1 remote control and signal circuit conductors: #14 AWG minimum.
   4. Class 2 for low energy remote control and signal conductors: #16 AWG minimum.

E. Parallel Conductors: Terminate on multiple barrel lugs or on a combination of multiple barrel lugs on a common bus. Verify under load, the division of the load between conductors. Where load differential between any two conductors of a phase exceeds 10 percent, correct to establish a load differential between conductors of less than 10 percent. Make record of tests for each feeder, indicating the conductor size, load in each conductor, voltage, and identification of feeder. Each test record, and retest following corrective measures, shall be signed by the individual conducting and the individual witnessing the test.

F. Conductor Identification: Provide identification for each feeder conductor within each enclosure where a tap, splice, or termination is made. Identify by means of nylon marker ties, Type “PLM” as manufactured by Panduit Corporation, or as approved.

G. Neatly train and bundle wiring within switchboards, panelboards, terminal cabinets, and similar enclosures, using nylon locking type cable ties, as manufactured by Thomas & Betts, Panduit, Ideal, or as approved.

H. Conductor Installation:
   1. Handle and install to ensure that maximum tensile and compressive strengths of conductor and insulation are not exceeded and that the conductors are not kinked or the insulation damaged.
   2. Wire pulling lubricant: UL listed products recommended or specified by the wire and cable manufacturers with which the lubricant is utilized. The use of soap flakes, liquid detergents, or vegetable oils is unacceptable.
   3. Install line and load side conductors of feeders and branch circuits in separate conduits, except that lighting switch legs may be installed in the same conduit with branching wiring. Line and load conductors of feeders and branch circuits may be installed in nipples of 6-inches or less length at wireways (gutters).
   4. Do not install feeder and branch circuit conductors in the same conduit.

I. Homerun – Definition: The branch circuit conductors extending from the receptacle outlets, lighting fixture or from electrical utilization equipment and appliances to an overcurrent protective device.

J. Splices and Terminations: Provide as specified in Section 26 05 20, “Wire Connections and Splices”.

K. Dedicated Neutral Conductors: Provide for branch circuits for all line to neutral loads.

L. Multi-wire Branch Circuits, employing multiple phase conductors and a common shared neutral, are not acceptable.

M. Maximum number of current carrying phase conductors in any conduit: Three (3).

3.2 FIELD QUALITY CONTROL

A. Torque conductor connections and terminations to manufacturer's recommended values.

B. Perform continuity and phase rotation tests on service entrance, feeder and branch circuit conductors before energizing.

C. Conductors In Vertical Conduits Or Raceways: Support in the manner set forth in the appropriate section of the latest revision of the National Electrical Code. Lighting fixtures shall not be used for raceways for circuits other than parallel wiring of fixtures.

D. Conductors may be run in parallel in sizes 1/0 to 750 kCM, provided that paralleled conductors are the same size, length and type of insulation. Except as otherwise specified in Drawings, not more than three conductors may be run in parallel. Install and terminate conductors to ensure equal division of the total current between the several conductors. See paragraph 3.01.E.

3.3 TESTING AND ACCEPTANCE

A. Before final acceptance, perform insulation resistance and load tests sufficient to demonstrate to the Owner's representative the satisfactory installation and proper performance of wire and cabling systems.

B. Perform insulation resistance test, at 600v d.c., on service entrance and feeder conductors rated 600 Amp and greater. Record test results and submit with Owners Operating and Maintenance Manuals. Test results below 30 megohms shall be cause for rejection of the wiring installation. Replace and retest each rejected conductor.

END OF SECTION

SECTION 260520 - WIRE CONNECTIONS AND SPLICES (600 VOLTS AND LESS)

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This section includes work required to provide connectors and splices for wire and cable rated 600 volts and less.

B. Related Work: This Section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. NFPA 70-2020 – National Electrical Code (NEC).

B. UL 486A, 486B, and 486C – Underwriters Laboratories.

1.3 SUBMITTALS

A. Submit manufacturer’s data demonstrating compliance with this Specification in accordance with Section 260500 if other than the specified products are provided.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Anderson Electric Corp.

B. Buchanan Electric Products Corp.

C. Burndy Corp.

D. Ideal.

E. Ilsco.

F. O.Z. Electrical Manufacturing Company.

G. Penn-Union Electric.

H. Thomas and Betts Company.

I. 3-M Corp.

J. N.S.I. Industries. (NEISD)

K. Polaris. (NEISD)

2.2 MATERIALS

A. Splices and Connectors (UL 486A, 486B, and 486C) 600 Volts or Less: Connectors for wires #8 AWG and smaller insulated pressure type (twist-on splicing connector) in accordance with UL 486A or UL 486C. Equal to Buchanan “B-Cap” connectors.

B. Terminations (UL486A and 486B) 600 Volts or Less: With terminating kits designed for the conductor and insulation type, and for the intended application.

C. Connectors: Of material compatible with the materials of the conductors to prevent corroding, differences in coefficients of expansion, or electrolysis.

PART 3– EXECUTION

3.1 INSTALLATION

A. Splices and Terminations: Splices in conductors shall be as few as possible. Install to ensure that the electrical resistance does exceed that of 2 feet of the equivalent conductor. Make splices and terminations only in junction or pull boxes. Splices will not be allowed in panelboards, switchboards or motor control centers.

B. Terminate stranded copper cables using solderless lugs. Binding posts are not acceptable.

C. 600 volt copper wire #8 and smaller, use insulated pressure type (twist-on splicing connector); #6 and larger, provide insulated parallel connectors applying tape to an equivalent insulation thickness on uninsulated splices and an insulating coat of sealing compound. Manufacturer’s recommendations and instructions shall be strictly followed.

D. Connections: Make with screw-on, set-screw, clamp-on, split-bolt, crimp and compression type lugs, taps, and terminal fittings.

E. Tools: Use tools specified or recommended by the manufacturer.

END OF SECTION

SECTION 260526 - GROUNDING

PART 1– GENERAL

1.1 DESCRIPTION OF WORK

A. Summary: This Section includes the work required to provide grounding for service entrance, separately derived systems, isolated ground systems, and equipment.

B. Related Sections:
   1. Section 260573 – Overcurrent Protection and Coordination Analysis.

1.2 REFERENCE AND STANDARDS

A. IEEE 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

B. NFPA 70-2020 – National Electrical Code (NEC).

C. UL 467 – Grounding and Bonding Equipment.

D. ANSI/IEEE C2 – National Safety Code.

E. IEEE 80 – Guide for Safety in Substation Grounding.

F. IEEE 837 – Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 QUALITY ASSURANCE

A. Manufacturers: Manufacturers regularly engaged in the manufacture of grounding equipment and components of the types specified for a period of not less than five years.

1.4 SUBMITTALS

A. Submit manufacturer product data demonstrating compliance with this specification if other than the specified products are provided.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Connectors:
   1. Blackburn.
   2. Buchanan Electrical Products Corp.
   3. Burndy Corp.
   4. Cadweld, a brand of Erico International Corp.
   5. Harger Lightning & Grounding.
   6. O-Z/Gedney Co.
   7. ThermOweld, a brand of Continental Industries, Inc.
   8. Thomas & Betts Corp.

B. Ground Rods:
   1. Blackburn.
   2. Copperweld Corp.
   3. Erico International Corp.

4. Galvan Industries, Inc.
5. Harger Lightning & Grounding.
6. Teledyne Metal Forming.
7. ThermOweld, a brand of Continental Industries, Inc.

2.2 MATERIALS

A. Ground Rods: 3/4-inch copper clad steel rods, minimum diameter by 10'-0" long.

B. Connectors: Fabricated of pure wrought copper, irreversible compression type, Burndy HYGROUND Compression System or equivalent.

C. Grounding Electrode Conductor and Bonding Jumpers: Soft drawn bare copper.

D. Equipment Grounding Conductors: Copper conductor having a green insulating jacket for sizes #10 and smaller and color code tape or wire markers sizes #8 and larger.

E. All materials UL listed.

F. Conductors #8 AWG and larger, stranded. Conductors smaller than #8 AWG, solid wire.

PART 3– EXECUTION

3.1 SYSTEM GROUNDS – 600 VOLTS AND LESS

A. Provide ground electrode system at the disconnecting means of each service entrance at each building and at each separately derived system. Install ground electrode system in accordance with NEC Article 250.50. Connect available and made ground electrodes specified herein to the system grounded conductor (neutral) by means of bonding jumper sized in accordance with NEC. Provide main bonding jumper, sized in accordance with NEC, between the system grounded conductor and the equipment ground bus within the service entrance equipment.

B. Standby generators shall be considered as separately derived systems when 4-pole transfer switches (which switch the neutral) are utilized and the generator neutral shall be grounded as described for transformers. When 3-pole transfer switches with solid neutrals are utilized, the generator is not considered a separately derived system and the generator neutral shall not be grounded or bonded to the grounding conductor at the generator.

C. Provide building system grounding riser conductors as specified and detailed in the Drawings.

D. Utilize and provide grounding electrodes as follows:
   1. Concrete encased electrode consisting of a minimum of 20 feet of 1/2-inch diameter rebar or of a minimum of 20 feet of #4 AWG bare copper conductor with a minimum of 2-inches of concrete cover, located at the bottom of the foundation footing or pier.
   2. Effectively grounded building structural steel.
   3. Metal underground water pipe, if permitted by the local authorities and if in direct contact with earth for at least 10 feet from point of exit of the structure.
   4. Made electrode, consisting of three ground rods.

E. Provide grounding electrode conductor at the secondary of transformers constituting separately derived systems, in accordance with NEC and as follows:
   1. Bond secondary neutral conductor to the metal enclosure of the transformer using conductor sized in accordance with NEC.
   2. Grounding electrode conductor sized, in accordance with NEC connected from secondary neutral terminal to a grounding electrode as near as practicable to and preferably in the same area as the transformer. The equipment-grounding conductor at the line side of and bonded to the transformer enclosure shall not be utilized as the separately derived system-grounding electrode.
   3. Connect the grounding electrode conductor to the facility grounding electrode riser.

F. Install grounding electrode conductors via the shortest and most direct path from equipment to ground.

G. Install grounding electrode conductors in metallic conduit with both the conductor and the conduit bonded at each end.

H. Bond interior metal piping systems to the service equipment ground electrode, or to one or more of the provided grounding electrodes. Bonding jumper connections must be accessible.

I. Install equipment-grounding conductors in conduit and other acceptable raceway to protect from physical damage.

J. Provide at each ground rod, an inspection well consisting of a minimum 6-inches diameter concrete pipe with cast iron or steel cover installed flush with finished grade. No unguarded length of ground rods shall be exposed above finished grade.

K. Connections (except concrete encased or buried) shall be accessible for inspection and servicing.

L. Provide irreversible compression or exothermic weld type connections for buried and concrete encased connections.

M. Provide bolted fittings at building steel ground connections.

N. Provide clamp type fittings at pipe and rod connections.

3.2 EQUIPMENT GROUNDING

A. Ground the noncurrent-carrying metallic parts of electrical distribution systems and equipment and utilization equipment fixed in place or connected by permanent wiring by means of the metal raceway system and by a supplemental equipment grounding conductor as specified in 2.2 D.

B. Install equipment-grounding conductors in the same conduit with circuit conductors. In multiconductor cable provide inside the cable sheath or jacket.

C. Equipment grounding conductor identification; #8 and larger conductors using 3M #35 vinyl tape at every point where the conductor is accessible.

D. Lighting Standards, 12 feet or more in Height: Provide at each, in addition to the circuit equipment grounding conductor, a ground rod in accordance with 2.02 A. and #6 AWG grounding conductor. Install ground rod within 24-inches of the pole base or within the bottom of the pole base excavation.

E. Connect grounded circuit conductor and equipment-grounding conductor to equipment and devices in such a manner that removal of the device will not degrade the integrity of the grounded circuit conductor (neutral) or the equipment-grounding conductor.

3.3 RACEWAY AND ENCLOSURE BONDING

A. Provide bonding jumpers at remaining concentric or eccentric knockouts that are punched or otherwise formed in the enclosures and boxes on systems of greater than 150 volts to ground.

B. Provide bonding jumpers at expansion joints in metallic conduit systems.

C. Bond metallic raceways, cable trays, equipment, frames, enclosures and other noncurrent-carrying metallic parts together, independent of the green equipment-grounding conductor, in accordance with Article 250.96.

D. Metallic Conduits Entering Enclosures and Equipment from Below Grade or Finished Floor: Bond to the enclosure or equipment entered.

E. Provide minimum 6'-0" clearance between metal raceways, enclosures, frames and other non-current carrying metal parts of electrical equipment and lightning protection system conductors.

F. Bond together the noncurrent-carrying metallic parts of raceways, enclosures, meter fittings and service equipment containing service conductors in accordance with NEC.

G. Provide bond between conduits containing communications conduits and cable trays.

3.4 GENERAL

A. Clean contact surfaces thoroughly before connections are made to ensure clean metal to metal contact.

B. Splice grounding conductors only at equipment enclosures or accessible pull or junction boxes.

C. Ground communications equipment in accordance with NEC.

D. Ground communications and television antennas in accordance with NEC. Provide antenna discharger units as required by Article 810.

E. Ground cable television systems in accordance with NEC.

3.5 POOLS

A. All pools, fountains, etc., shall be grounded in accordance with NEC Article 680.

B. Bonding:
   1. All metallic, noncurrent carrying components of a pool system shall be bonded together. This includes forming shells of underwater lights, ladders, rails, fill spouts, drains, reinforcing bars, transformer enclosures supply underwater lights, and pump equipment.
   2. All metallic conduit piping, reinforcing steel, and other noncurrent carrying components located in or within 5 feet of a pool must likewise be bonded together and grounded.
   3. Bonding conductors shall be solid #8 copper. They may be insulated, covered, or bare.
   4. All metallic components shall be bonded to a common bonding grid. This grid can be pool structural reinforcing steel, a metal pool wall, or a solid copper conductor loop not smaller than #8. The pool structural reinforcing steel may be used as the common grid where metal tie wire is used to tie the rebar together.
   5. Bond connections to iron reinforcing bar shall be made with exothermic welds.
   6. Connectors for connection to aluminum parts shall be listed or indicated for that purpose.

C. Grounding:
   1. All wet nitch and dry nitch underwater lighting fixtures, all electric equipment within 5 feet of the inside walls of the pools, all electric equipment associated with the pumps, junction boxes and transformer enclosures, GFCI's and panelboards supplying the pool electrical equipment must be grounded.
   2. The equipment conductor shall be an insulated conductor.
   3. The equipment grounding conductor shall not be smaller than #12.
   4. The equipment grounding conductor shall be installed without joints or splices except in boxes and enclosures where allowed in the code.

3.6 TESTS

A. Perform ground resistances test of system grounds, including separately derived systems, using the fall of potential method as recommended by IEEE 81. Perform tests in normally dry weather and not sooner than 24 hours after rainfall. Record test results and submit to the Architect/Engineer with the project record documents. If any measurement exceeds 25 ohms, verify system connections and repeat test. If resistance remains greater than 25 ohms, notify the Architect/Engineer immediately.

END OF SECTION

SECTION 260533 - RACEWAY SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This section includes the work required to provide raceway systems.

B. Raceway systems included:
   1. RMC: Rigid metal conduit.
   2. IMC: Intermediate metal conduit.
   3. EMT: Electrical metallic tubing.
   4. FMC: Flexible metal conduit.
   5. LFMC: Liquidtight flexible metal conduit.
   6. PVC: Rigid polyvinyl chloride conduit.
   7. SMR: Surface metal raceway systems.

C. Electrical Non-metallic Tubing (ENT) or other flexible nonmetallic conduit systems are unacceptable.

D. Related Work: This section is a Division 26 Specification and as such will be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCES

A. ANSI C80.1 – Rigid Steel Conduit – Zinc Coated.

B. ANSI C80.3 – Electrical Metallic Tubing – Zinc Coated.

C. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies.

D. NFPA 70-2020 – National Electrical Code (NEC).

E. NECA “Standard of Installation”.

F. NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

H. UL 1 – Underwriters Laboratories.

I. UL 6 – Underwriters Laboratories.

J. UL 360 – Underwriters Laboratories.

K. UL 514B – Underwriters Laboratories.

L. UL 797 – Underwriters Laboratories.

M. UL 1242 – Underwriters Laboratories.

1.3 HANDLING AND STORAGE

A. Handle and store materials in dry, protected locations to prevent damage, restriction to the interior cross-sectional area, and oxidation.

1.4 SUBMITTALS

A. Submit manufacturer's product data, sufficient to demonstrate compliance with the specifications, in accordance with Section 260500 if other than specified products are provided.

PART 2– PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Conduit:
   1. RMC, IMC, and EMT:
      a. Allied Tube and Conduit Corp.
      b. LTV/Republic Steel Corp.
      c. Wheatland Tube & Conduit.
   2. FMC and LFMC:
      a. American Flexible Conduit Company.
      b. Anamet, Inc.
      c. Electri-flex Company.
      d. International Metal Hose.
   3. PVC:
      a. Can-Tex Industries.
      b. Carlon.
      c. Certainteed Corp.
   4. Surface Non-Metallic Raceway Systems:
      a. Wiremold.
      b. Panduit Corp.
   5. Conduit Supports and Hangers:
      a. Appleton.
      b. B-Line Systems.
      c. Caddy.
      d. Crouse-Hinds.
      e. Kindorf.
   6. Insert Anchors:
      a. Ackerman-Johnson.
      b. B-Line Systems.
      c. Paine.
      d. Phillips.
   7. Expansion Fittings:
      a. Appleton.
      b. Carlon (PVC).
      c. Crouse Hinds.
      d. Eaton.

2.2 MATERIALS

A. RMC:
   1. NEC Article 344, ASTM Standard A-153, ANSI C80.1, and UL 6 listed and labeled.
   2. Fittings: Threaded type, cadmium or zinc coated. UL 514B.
   3. Conduit sealing bushings; OZ/Gedney Type CSBI.

B. IMC:
   1. NEC Article 342 and UL 1242.
   2. Fittings: Threaded type, cadmium or zinc coated. UL 514B.

C. EMT:
   1. NEC Article 358, UL 797, and ANSI C80.3.
   2. Fittings: ANSI/NEMA FB 1.
      a. Couplings: Watertight steel compression type**.**
      b. Connectors: Watertight steel.
      c. Zinc alloy die cast fittings are not acceptable.

D. FMC and LFMC:
   1. NEC Article 348 and Article 350, and UL 1. Hot-dipped galvanized steel or aluminum interlocked spirally wound.
   2. Provided with PVC jacket, UL 360, for installation in damp and wet locations and for pump motors.
   3. Fittings: ANSI/NEMA FB 1 and UL 514, squeeze type, cadmium or zinc coated malleable iron. Screw-in fittings are acceptable for use only on 1/2-inch or 3/8-inch fixture whips.

E. PVC:
   1. NEC Article 352, Type EPC-40 (EPC-80), NEMA TC2, UL 651, and Federal Specification W-C-1094A.
   2. Fittings: NEMA TC3.

F. Through Penetrations: In accordance with Division 07.

G. Surface Non-Metallic Raceways
   1. Raceway and component accessories fabricated of rigid PVC compound with matte texture and manufacturers standard color.
   2. Two-piece construction consisting of base and snap on cover and having two wiring channels, separated by an integral barrier and of sufficient capacity accept standard power and communications devices without restricting the capacity of the adjacent channel.
   3. Nominal Dimensions: 5.25-inches high by 1.75-inches deep and of minimum capacity of 7.4 cubic inches.
   4. Elbows and Fittings: Of capacity and dimensions to maintain a controlled 2-inch minimum cable bend radius in accordance with TIA/EIA 569A.
   5. Device brackets and face plates for in-line and off-set installation permitting up to three single gang openings at one location.
   6. Wiring Devices: In accordance with Section 26 27 26.
   7. Information Technology Devices: In accordance with Section 26 05 35.
   8. Basis of Design, Construction and Performance: Wiremold Type 5400 non-metallic raceway systems.

PART 3– EXECUTION

3.1 INSTALLATION

A. General Requirements: Install raceways in compliance with the requirements of NEC and these Specifications.

B. RMC and IMC:
   1. Provide in mechanical equipment rooms to a height of 60-inches above finished floor, for service entrance conduits, feeder conduits, in damp and wet locations, where exposed to physical damage, and for conduits installed underground, except as herein otherwise allowed.
   2. Installed underground, protect by the application of 0.010-inch thick pipe wrapping tape, field applied with 50 percent spiral overlap, or provide a factory applied exterior plastic resin, epoxy coating 0.02-inch thick.

C. EMT:
   1. May be installed:
      a. Concealed above grade.
      b. Where exposed 60-inches above finished floor in mechanical rooms.
   2. Shall not be installed:
      a. For feeder conduits.
      b. Underground.
      c. In ground bearing concrete slabs.
      d. In hazardous, classified locations.
      e. In areas where subject to physical damage.
      f. In damp or wet locations.
      g. In underfloor crawl spaces.
      h. On roofs / outdoors.

D. PVC:
   1. May be installed for underground branch circuit and feeder conduits from a point 5'-0" outside the building line to the point of exposure above grade or the load served. Provide RMC elbows at transition from underground to above grade.
   2. May be installed under building slab on grade when encased in a 3-inch thick envelope of 2500 psi concrete. Where passing through beams or footings, provide RMC to extend 5'-0" either side thereof. Where passing below grade beams, install minimum of 12-inches below bottom of beam.
   3. Shall not be installed concealed or exposed within the building.
   4. Below grade installation: Minimum trade size permitted for below grade installation, 1-inch diameter. Make joints watertight. Install couplings, connectors, and elbows using approved adhesive, driving joint tight and ensure permanent adhesive set prior to backfill or conductor installation.

E. FMC and LFMC:
   1. Provide from point of connection to rotating, reciprocating and vibration producing equipment and machines, to the point of connection with the rigidly supported conduit wiring system. Minimum length: 18-inches or 12-inches per 1-inch of conduit diameter, whichever is greater. Maximum length shall be 36-inches.
   2. May be installed in lengths to 72-inches maximum to connect recessed lighting fixtures installed in accessible ceilings to the branch circuit wiring system.
   3. May be installed in dry locations where conditions preclude the installation of rigid conduit systems, or to span expansion joints by connecting between pull boxes located either side of the joint. Provide in sufficient length to compensate for joint movement.

F. Conduit Installation: Conceal conduit within walls, ceilings, plenums, and chases. Where installed exposed in other than mechanical and electrical rooms, obtain the approval by the Architect/Engineer prior to installation.

1. DO NOT INSTALL CONDUITS CONTAINING FEEDERS OR BRANCH CIRCUITS IN GROUND BEARING OR STRUCTURAL CONCRETE SLABS OR IN CONCRETE STRUCTURAL MEMBERS. EXCEPTION: LIGHTNING PROTECTION DOWN CONDUCTORS; BRANCH WIRING SERVING FLOOR OUTLETS AND FLOOR MOUNTED EQUIPMENT AND AS SPECIFICALLY NOTED HEREIN OR WITHIN THE CONSTRUCTION DRAWINGS.
2. Minimum Acceptable Conduit Trade Size: 1/2-inch diameter.
3. Do not install in the horizontal above or below in parallel with steam, water, or waste piping. Maintain parallel runs a minimum of 6-inches from steam and hot water piping, and a minimum of 24-inches from boiler flues or exhaust stacks.
4. Install parallel with or at right angles to building lines, structural members, ceiling members, and walls where located above accessible ceilings or where visible after completion of project. In underfloor crawl spaces, routing may be direct reckoning.
5. Make changes of direction using field bends, factory elbows, UL listed conduits bodies, or appropriately sized junction or pull boxes. Make field-bends and offsets using proper conduit hickeys, hand benders, or mechanical benders.
6. Provide pull boxes to limit the number of equivalent 90 degree bends in any conduit run to three (3).
7. Install conduits passing through fire rated partitions, walls, and floors in a manner so as to maintain the specified and required fire rating. Seal openings and annular spaces of pipe sleeves with UL listed component materials. Acceptable manufacturers: 3M, General Electric and Dow.
8. Provide, for conduits penetrating fire rated floor structures and serving floor mounted power outlets, wiring devices, or communications outlets, UL listed assemblies as specified in Division 1.
9. Terminate threaded conduits in unthreaded openings of metallic and nonmetallic boxes and cabinets using two locknuts and nonmetallic insulating bushings or with one locknut and one insulated throat malleable iron or steel bushing. Zinc die cast metallic bushings are not acceptable.
10. Terminate unthreaded conduits of 1/2-inch and 3/4-inch in unthreaded openings of metallic and nonmetallic boxes and cabinets using conduit connector fittings. Provide insulated throat connector fittings for conduits 1-inch and larger. Provide insulated throat metal grounding bushings at termination point of metallic service entrance conduits.
11. Prevent concrete, plaster, dirt, trash, or other foreign materials from entering or lodging in conduit systems and equipment during construction.
12. Provide pull wire in empty conduit systems.
13. Field Cutting and Threading: Cut conduit ends square, thread using proper hand or power machines, ream and leave cut ends free of burrs and jagged edges. Paint threads with Thomas and Betts “KOPR-SHIELD” compound. Paint exposed threads with a cold galvanizing compound.
14. Conduit systems shall be complete and electrically continuous before conductors are installed.
15. Provide insulated bushings for conduits terminating or stubbing-out into plenums, chases, raised floors, and communications equipment rooms where wiring method changes from wiring in raceway to open wiring.
16. Spare Conduits: Provide a minimum of three (3) 3/4-inch conduits from each flush mounted panelboard to an accessible ceiling location.
17. Where the installation necessitates the use of flexible conduit, provide liquid tight PVC jacket and terminate using UL listed liquid tight fittings where installed in damp and wet locations and in locations subject to airborne oil, grease, exhaust fumes, or similar contaminants.

G. Conduit Support:
   1. Provide, for each conduit type, supports at intervals in accordance with NEC Chapter 3. Support conduit by means of pipe straps, wall brackets, hangers, or trapeze assemblies. The load applied to fasteners, anchors and trapeze assemblies shall not exceed 25 percent of the maximum rated working load. For pipe strap installations on conduit sizes 1-inch and larger provide two hole type pipe straps. The use of perforated strap iron is unacceptable.
   2. Trapeze Assemblies:
      a. Maximum Applied Load – 25 percent of rated working load of the assembly.
      b. Maximum horizontal distance between vertical supporting elements: 36-inches.
      c. Maximum permissible vertical deflection of horizontal supporting elements: 1/4-inch.
   3. Fasten to wood surfaces using wood screws; to hollow masonry units using toggle bolts; to concrete and brick surfaces using lead inserts or expansion bolts; to metal, lumber and steel work using machine screws or spring tension clamps. Use insert anchors in poured-in-place concrete construction. Threaded C-clamps may be used only on RMC and IMC. Do not weld pipe straps or conduits to structural steel members.
   4. Multiple conduits, installed in parallel may be supported by means of trapeze assemblies fabricated of minimum 3/8-inch diameter galvanized all-thread rods and galvanized steel channel, assembled and supported by inserts, beam clamps, bolts, flat washers, lock washers, and hex nuts. Fasten conduits to the first, last, and alternate trapeze assemblies by means of two-hole straps or u-bolt clamps. Load trapeze assemblies to not greater than 1/4 (25 percent) of the rated load capacity.
   5. Do not support branch circuit conduit systems utilizing suspended ceiling supporting systems.
   6. Support vertical risers by U-clamp hangers at each floor level and at intervals not exceed 10’-0”.
   7. Support FMC and LFMC at intervals not exceeding 36-inches on center and within 12-inches of each termination in a junction or pull box, conduit fitting, or cabinet.
   8. Sleeves and Inserts: Layout in advance of the construction of structural members, walls, floors, and roof decks and install in the proper sequence of work. Sleeves shall be as specified in Section 260500, “General Requirements for Electrical Work”.
   9. Coordination: Prior to rough-in, coordinate the work of this section with that of other divisions and sections to avoid conflicts of space utilization.
   10. Expansion Fittings: Provide for expansion, and contractions and structural movement of raceways. Install expansion fittings or assemblies in raceways, at least every 200 feet in each linear run or where ever structural expansion joints are crossed. Expansion fittings shall be as required by the wet or dry space installation.

H. Underground Conduits:
   1. Excavation and Backfill:
      a. Excavate along straight lines to the width and depth required for proper installation of conduits. Where excavated below the necessary elevation, backfill with sand and compact to the proper elevation.
      b. Where rocks, materials with sharp edges, permanently moist, or unstable ground is encountered, excavate to a depth 4-inches below the specified elevation, and backfill with 4-inches of sand, free of particles that would be retained by a 1/4-inch sieve.
      c. Dewater trenches before installing conduit.
      d. Backfill in not more than 6-inch lifts, compacted to 95 percent of the density of adjacent soil, with soil materials free of rocks, debris, roots, wood, scrap materials, or vegetable matter.

e. Where necessary to remove sod, remove in large sections and carefully set aside and care for until replaced. Backfill the top 4-inches of trench with topsoil before replacing sod. Carefully replace sod and water thoroughly. If dead or severely damaged, replace with like material or seed as directed by the Architect.

2. Underground Conduits Without Concrete Encasement:
   a. Install to code required depth, but not less than 24-inches, below finished grade or as detailed in the drawings and at a minimum slope of 3-inches per 100-feet away from buildings.
   b. Following backfill and prior to conductor installation, clean each conduit using a testing mandrel not less than 12-inches long with a diameter 1/4-inch less than the inside diameter of the conduit. Pull through the conduit followed by a brush having stiff bristles, until the conduit is clear of all particles of earth, sand, gravel and other contaminates.
3. Underground Conduits, Concrete Encased:
   a. Provide concrete encasement of conduits extending below slab on grade, below paved areas, roadways, driveways, and parking areas and where specified in the drawings.
   b. Extend concrete encasement to a minimum of five (5) feet beyond the edges of paved areas, driveways and roads. Conduits installed under existing paved areas which are not to be disturbed shall be RMC and shall be jacked into place.
   c. Provide base and intermediate spacers to allow a minimum of 3-inches of encasement on all sides and a minimum of 2-inches parallel runs.
   d. Following backfill and prior to conductor installation clean each conduit using a testing mandrel not less than 12-inches long with a diameter 1/4-inch less than the inside diameter of the conduit. Pull through the conduit followed by a brush having stiff bristles until the conduit is clear of all particles of earth, sand, gravel and other contaminants.
   e. Concrete – Class B, 2500 psi, maximum aggregate size of 3/4-inch, slump test of 3-inches to 4-inches.
4. Provide O.Z./Gedney Type “CSBI” conduit sealing bushings where service entrance conduits enter service equipment.
5. Underground conduits shall be observed and accepted by the Owner’s Representative before backfill or encasement. Notify the Owner’s Representative a minimum of 48 hours before an observation is required.
6. Provide ductline marking tape 12-inches below finished grade over underground power and communications service entrance and feeder conduits.

I. The minimum bend radius for underground service entrance and feeder conduit – 36-inches except at vertical risers to equipment.

J. Wall Penetrations Below Grade:
   1. Where conduits enter an interior building space through concrete construction below finished exterior grade, provide the following construction for each conduit:
      a. Poured-in-place water stop steel sleeve, equal to Link Seal Model AWS.
      b. Seal annular space between conduit and sleeve using Link Seal Type LS Model C sealing assemblies, O.Z./Gedney series CSM sealing fittings or acceptable equivalent.
      c. Terminate conduit in junction or pull box and provide sealing bushings, O.Z./Gedney series CSBI, at cable exit from conduit into box.

END OF SECTION

SECTION 260534 - BOXES, WIREWAYS AND AUXILIARY GUTTERS

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: This section includes work required to provide outlet, floor and pull boxes, wireways and auxiliary gutters.

B. Related Work: This Section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. Codes and Standards:
1. NFPA 70-2020 – National Electrical Code (NEC).
2. UL 50 – Cabinets & Boxes.
3. UL 514A – Metallic Outlet Boxes.
4. UL 870 – Wireways, Auxiliary Gutters & Associated Fittings.
5. UL 886 – Outlet Boxes and Fittings for Use in Hazardous Locations.

1.3 SUBMITTALS

A. Submit shop drawings for non-standard pull, outlet, and junction boxes demonstrating compliance with the NEC and this Specification. Indicate dimensions and identify installed locations.

B. Submit manufacturer’s data sufficient to demonstrate compliance with this Specification if other than the specified products are provided.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Appleton Electric.

B. Eaton.

C. Thomas & Betts/Steel City.

D. Bowers Manufacturing Company.

E. Crouse-Hinds.

F. Hoffman Engineering Company.

G. Hubbell.

H. O.Z. Electrical Manufacturing Company.

I. Raco.

J. Wiremold/Walker.

2.2 PRODUCTS

A. Outlet Boxes and Covers:
   1. Concealed and Exposed Dry Locations (except where prohibited herein): One-piece 14 gauge zinc galvanized steel, in accordance with UL 514A, minimum 4-inch x 4-inch x 2-1/8-inch D. Covers: Zinc galvanized steel.
   2. Damp and Wet Locations – UL 514A: Cast aluminum with aluminum polymer enamel or malleable iron with zinc electroplate. Covers: Zinc coated steel or malleable iron or aluminum polymer enamel.
   3. Classified Hazardous Locations – UL 886: Malleable iron with zinc electroplate aluminum polymer enamel.

B. Floor Outlet Boxes: Provide floor boxes by acceptable manufacturer, equal in construction and characteristics, as specified and scheduled in the Drawings.

C. Junction and Pull Boxes: UL 514A and UL 50.

D. Wireways: UL 870.

PART 3– EXECUTION

3.1 INSTALLATION

A. General Requirements: Conform with NEC and the requirements specified herein. Install to permit working access.

B. Boxes, Outlets and Supports: Provide boxes in the raceway system where required for pulling conductors, making connections, and mounting devices and fixtures.
   1. Provide boxes of the volume required by NEC for the number and size of conductors installed. The use of box extension rings to increase box volume for the purpose of increasing the quantity of conductors permitted by Article 370 is not acceptable.
   2. Provide of minimum 2-1/8-inches deep except where shallower boxes are required due to structural conditions are approved. Provide accessories as required for the intended function at each box, including mounting hardware, hangers, extension rings, fixture studs and covers.
   3. Provide cast metal hub type within damp and wet locations, where surface mounted outside, and where installed in hazardous areas. Within dry locations, provide boxes of zinc galvanized steel. Provide gaskets for cast metal boxes installed in wet locations and for boxes installed flush with the outside of exterior walls. Provide knockout closures or plugs in unused openings.
   4. Boxes for other than lighting fixture outlets: Minimum 4-inches square by 2-1/8-inches deep.
   5. In masonry, block and tile walls provide square cornered masonry boxes or standard boxes fitted with square cornered tile rings.
   6. Boxes for surface mounted lighting fixtures: Minimum 4-inches square or octagonal, except that smaller boxes may be acceptable for use as required by fixture configuration.
   7. Boxes for ganged devices: 4-inch square for two devices and solid ganged boxes for more than two devices.
   8. Boxes for switches and receptacle outlets: 4-inch square and fitted with plaster or tile device rings appropriate to the installed location, conditions and wall construction and the quantity and type of devices contained.
   9. Thru-wall boxes and back-to-back installation are not acceptable. Provide minimum 6-inches horizontal or vertical separation of boxes installed on a non-rated common wall or partition. Provide 12-inches horizontal or vertical separation in fire-rated partitions. Provide minimum 24-inches separation in acoustical rated walls.

10. Supports:
    a. Support boxes and pendants for surface mounted fixtures independent of suspended ceiling supports, or make adequate provisions for distributing the load over the ceiling supporting members using a minimum of two approved bar hangers or 1-1/2-inch lathers channels spanning the horizontal ceiling suspension members.
    b. Fasten boxes and supports with wood screws to wood, with expansion bolts or metallic (lead) anchors on concrete and brick, with toggle bolts on hollow masonry units and gypsum board, and with machine screws on steel work. Plastic anchors are not acceptable.
    c. In light weight metal stud construction, support boxes using Caddy Fasteners series “SGB” screw gun brackets, series “H” box mounting brackets or series “RBS” box mounting brackets.
    d. Do not utilize outlet boxes to support fixtures or loads of 25 lbs. or greater, or for supporting ceiling fans. Support fixtures and loads greater than 25 lbs. and ceiling fans from building structure, independent of the associated outlet box, raceway and ceiling suspension system, except where the box is specifically designed for the application.
    e. Support cast metal boxes by means of integral mounting lugs or by the raceway system in which installed. Drilling of cast boxes is not acceptable.
11. Locations of Outlets:
    a. Carefully layout the location and elevation of each box, coordinating with architectural appurtenances, millwork, casework and furniture. Examine the architectural documents to ensure that outlet locations and elevations agree with provided details. Architectural details of box and outlet locations have precedent.
    b. Install boxes in a manner to ensure that the equipment or piping of other trades passing under, over, across, or in close proximity to will not cause the box to be inaccessible for use or maintenance.
12. Mounting Heights: Unless otherwise noted in the drawings, mounting heights for the box mounted devices shall be as listed below.

OUTLET MOUNTING HEIGHT	
Wall Switches	48” (to top of box)
* Receptacles	15” (to bottom of box)
Toggle Switches	48” (to top of box)
Desk Telephone Outlets	15” (to bottom of box)
** Wall Telephone Outlets	48” (to top of box)
Disconnect Switches	66” (maximum)
Clock Outlets	90” (to top of box)
Alarm Bells	84” (to bottom of box)
Wall Speaker Outlets	90” (to top of box)
Push-button Stations	48” (to top of box)
Emergency Lighting Units	96” or 6” below ceiling
* A.C. – above counter tops (6” normally). Verify exact mounting heights required with architectural details. Mount in horizontal orientation.	
** Wall mounted public telephones, handicap accessible – 36”	

13. Provide blank covers for boxes that are not covered by device plates or lighting fixtures.
14. In dry locations, provide 1/2-inch raised galvanized device covers for surface mounted boxes.
15. Install boxes so that device covers are plumb and tight against the wall finish.
16. Center wall bracket outlets on columns and above doors where indicated at these locations.
17. In noncombustible walls and ceilings, install recessed boxes with from edge set back not more than 1/4-inch from the finished surface. In combustible construction, install with front edge flush with finished wall or ceiling surface.
18. In plaster, drywall, or plasterboard surfaces, gaps or open spaces at the edge of the box or fitting greater than 1/8-inch are not permitted.

C. Floor Outlet Boxes:
1. In damp and wet locations and in slabs in direct contact with earth, provide Class I, cast iron, water tight boxes. In suspended slabs, provide Class II, concrete tight boxes.
2. Box for slabs 3-inches thick shall be 2-inches deep maximum and for slabs 4-inches or greater thick, 3-5/8-inches deep (nominal) maximum.
3. Unless otherwise scheduled in the Drawings, provide each single service power outlet box with a 20A, 125V, 3-wire duplex receptacle and with black hinged lift lid duplex coverplate. In carpeted locations, provide with a black carpet flange.
4. Unless otherwise scheduled in the Drawings, provide boxes indicated for telephone or communications service with black finish, metal body coverplate having combination 1-inch/2-inch round concentric screw-in plugs. In carpeted locations provide with black carpet flange. Provide multiple service boxes as specified and scheduled in the Drawings. Finish top lid by inserting floor covering material matching adjacent flooring.

D. Junction and Pull Boxes and Wireways:
1. Not less than the minimum size required by NEC.
2. Materials: Code gauge galvanized sheet metal, except where cast metal boxes are required in locations specified above or of concrete, cast iron or composition materials as specified in the Drawings. Provide with screw fastened covers and install with cover accessible.
3. Provide non-metallic, insulating cable supports in boxes of 36-inches or greater in any direction.
4. Boxes exceeding 36-inches in any direction: Provide with multiple point hinged cover and positive mechanical latches. Exception: In installed locations not permitting minimum 90 degree opening of single door, provide double door.

END OF SECTION

SECTION 260535 - VOICE AND DATA COMMUNICATION RACEWAY SYSTEM

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: This section includes work required to provide a system of raceways, outlet boxes with covers, terminal boards, and grounding to accommodate the installation under separate Contract of communication system cabling and equipment.

B. Related Work: This is a Division 26 Specification and as such shall be taken as an integral part of other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. NFPA 70-2020 – National Electrical Code (NEC).

1.3 SYSTEM DESCRIPTION

A. It is the intent of this Specification to provide a system of raceways and outlets to accommodate the installation of communication cabling to be installed under a separate Contract. The Contract Drawings indicate the location and size of the main communication service entrance raceway and the locations of outlets and terminal boards. Routing of raceway systems between outlets and terminal points shall be determined in the field by the Contractor. Design of the raceway system is based upon the premise that the communication cabling system installer will provide UL listed low smoke producing plenum cabling conforming to NEC requirements, permitting open wiring in plenum areas above accessible ceilings.

PART 2- PRODUCTS

2.1 MATERIALS

A. Raceways: Provide in accordance with the requirements of Section 260533, “Raceway Systems”.

B. Boxes: Steel, minimum 4” x 4” x 2-1/8”, provided in accordance with the requirements of Section 260534, “Boxes, Wireways and Auxiliary Gutters”.

C. Outlet Coverplates: Provided in accordance with the requirements of Section 262726, “Wiring Devices”.

D. Terminal Boards: 3/4-inch Type AB plywood having two coats of insulating varnish or insulating oil base exterior enamel paint applied before installation on both sides and all edges. The quantity and dimensions shall be as indicated on the Drawings.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install materials required by the work of this Section in accordance with other Division 26 Specifications pertaining to the material.

B. Install terminal boards straight and level at locations indicated on the Drawings. Attach to masonry walls using expansion anchors, to CMU walls using toggle bolts, and to sheetrock and plaster walls using wood or sheet metal lag bolts fastened into the wall supporting structure. The use of toggle bolts in sheetrock and plaster walls is not acceptable. Secure at a maximum of 24-inches on center at the perimeter of each board.

C. At the main terminal board, stub-up the service entrance conduits at one of the board within 3-inches of the supporting wall.

D. Service entrance raceways shall be rigid steel or PVC concrete encased and steel reinforced where it passes through the foundation wall and for at least 5-inches outside the wall.

E. Unless otherwise indicated, distribution raceways shall be electrical metallic tubing, except that PVC Schedule 40 may be used where raceway is buried below concrete slabs, or in columns, or beams. Provide insulating bushings at ends of all conduit and tubing.

F. The conduit size for each outlet shall be 3/4-inch minimum. Common raceway shall not be used for multiple outlets.

G. Provide conduit from each outlet location to an accessible location above a lay-in type ceiling.

H. Provide raceways sufficient to accommodate communication cables where passing through mechanical and electrical equipment rooms, pipe chases, mechanical chases, areas without ceilings (exposed structure), and non-accessible areas such as ceiling plenums and crawl spaces.

I. Provide 3/4-inch conduit with #6 AWG copper ground wire from each terminal board location to and bond to the premises grounding electrode.

J. Provide pull wire or mylar cord in empty conduit.

K. Contact the local communication company to coordinate the exact main communication service entrance location and requirements prior to installing the service entrance raceways. Communication company charges for service work shall be included in the Contractor's bid.

END OF SECTION

SECTION 260536 - WIRE BASKET CABLE SUPPORT SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This Section includes materials and labor to furnish, install, and test, in conformity with applicable Codes and Authorities Having Jurisdiction, wire mesh cable tray support systems.

B. This Section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. Professionally recognized published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below but not limited to:

1. ANSI/NFPA 70 - National Electrical Code.
2. ASTM B 633 - Electrodeposited Coatings of Zinc on Iron and Steel.
3. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.
4. ASTM A 123 - Zinc (Hot Galvanized) Coatings on Iron and Steel.
5. ASTM A 510 - General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
6. NEMA VE 1-2002 - Metal Cable Tray Systems.
7. NEMA VE 2-2002 - Cable Tray Installation Guidelines.
8. ASTM A 641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
9. ASTM A 580 - Standard Specification for Stainless Steel Wire
10. ASTM D 769 - Standard Specification for Black Oxide Coatings

1.3 QUALITY ASSURANCE

A. Equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

B. Supply equipment and accessories new and free from defects.

C. Supply equipment and accessories in compliance with the applicable standards listed in Article 1.02 of this Section and with applicable national, state and local codes.

D. Items of a given type shall be the products of the same manufacturer.

E. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).

F. NFPA Compliance Comply with NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance” pertaining to installation of cable tray systems.

1.4 SUBMITTALS

A. Submittals shall be complete, bound under cover and indicating project title, specification section and/or drawings references. Contractor shall review submittals for conformance with Contract Documents, make necessary revisions and submit to Architect, indicating the following:

1. Manufacturer's name, brand name and catalog sheet(s) reference of equipment and materials specified under this Section.
2. Submit drawings of wire mesh cable tray and accessories including connector assemblies, clamp assemblies, brackets, splice plates, splice bars, grounding clamps and hold down plates showing accurately scaled components.
3. Submit manufacturer's data on wire mesh cable tray support system including, but not limited to, types, materials, finishes and inside depths.
4. The drawings, which constitute a part of these specifications, indicate the general route of the wire mesh cable tray support systems. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of dimensions, routing, etc., is required.
5. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship equipment in its original packages to prevent damaging or entrance of foreign matter. Handling performed in accordance with manufacturer's recommendations. Provide protective coverings during construction.

B. Replace at no expense to Owner, equipment or material damaged during storage or installation.

C. Deliver wire mesh cable tray support systems and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.

D. Store wire mesh cable tray and accessories in original cartons and in clean dry space, protected from weather and construction traffic.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with these specifications.

B. Basis of Design: Wire mesh cable tray support systems as manufactured by Cooper B-Line, Inc.

2.2 WIRE MESH CABLE TRAY SECTIONS AND COMPONENTS

A. Provide wire mesh cable tray of types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

B. Materials and Finishes: Material and finish specifications for Stainless Steel Wire are as follows:

1. Electro-Plated Zinc Galvanizing: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A 510, Grade 1008 and shall be electro-plated zinc in accordance with ASTM B633, Type III, SC-1.
2. Stainless Steel: Straight sections and accessories shall be made from AISI Type [304L][316L] Stainless Steel meeting the minimum mechanical properties of ASTM A 580.
3. Black Powder Coat: Straight sections shall be powder coated black with an average paint thickness of 1.2mils (30microns) to 3.0mils (75microns).
4. Pre-Galvanized Zinc: Straight section shall be made from pre-galvanized steel meeting the minimum mechanical properties of ASTM A 641.
5. Hot Dipped Galvanizing: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A 510, Grade 1008 and shall be hot dipped galvanized after fabrication in accordance with ASTM A 123.
6. Black Oxide: Certain support accessories and miscellaneous hardware shall be manufactured with a black oxide finish in accordance with ASTM D 769.

2.3 TYPE OF WIRE MESH CABLE TRAY SUPPORT SYSTEM

A. Straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety edge must be kinked and T-welded on tray sizes.

B. Wire mesh cable tray shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of straight section.

C. Wire mesh cable tray sizes shall conform to the following nominal criteria:

1. Straight sections shall be furnished in standard 118 inch lengths;
2. Wire diameter shall be 0.196” (5mm) minimum on mesh sections (minimum size of 4.5mm on stainless steel); and
3. Wire mesh cable tray shall have a 4 inch usable loading depth by 24 inches wide. Coordinate exact size needed with data/technology installers.

D. Fittings shall be field formed, from straight sections, in accordance with manufacturer's instructions.

E. In order for system to be approved as an Equipment Ground Conductor (EGC), splicing assemblies shall be UL/CSA approved as an EGC. When using powder coated wire mesh cable tray as an EGC, the paint must be completely removed at contact points of splice/ground bolt attachment.

F. Wire mesh cable tray supports shall be center support hangers, trapeze hangers or wall brackets.

G. Trapeze hangers or center support hangers shall be supported by 1/4 inch or 3/8 inch diameter rods.

H. Special accessories shall be furnished as required to protect, support and install a wire mesh cable tray support system.

PART 3– EXECUTION

3.1 INSTALLATION OF WIRE MESH CABLE TRAY

A. Install wire mesh cable tray as indicated; in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of NEC, and applicable portions of NFPA 70B and NECA's “Standards of Installation” pertaining to general electrical installation practices.

B. Coordinate wire mesh cable tray with other electrical work as necessary to properly interface installation of wire mesh cable tray runway with other work.

C. Provide sufficient space encompassing wire mesh cable tray to permit access for installing and maintaining cables.

END OF SECTION

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
   1. Identification labeling for raceways, cables, and conductors.
   2. Operational instruction signs.
   3. Warning and caution signs.
   4. Equipment labels and signs.

1.2 REFERENCES

A. ANSI Standard C2 and A13.1, “Scheme for the Identification of Piping Systems”, with regard to type and size of lettering for raceway and cable levels.

B. National Electrical Codes, NFPA70.

C. NEMA standards applicable to the product provided.

D. UL standards applicable to the product provided.

E. OSHA standards.

1.3 SUBMITTALS

A. Manufacturer’s product data on each product and component.

B. Manufacturer’s written installation instructions for each product and component.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. American Labelmark Co.
   2. Brimar. (NEISD)
   3. Calpico, Inc.
   4. Cole-Flex Corp.
   5. Emed Co., Inc.
   6. George-Ingraham Corp.
   7. Ideal Industries, Inc.
   8. Kraftbilt.
   9. LEM Products, Inc.
   10. Markal Corp.
   11. National Band and Tag Co.
   12. Panduit Corp.
   13. Radar Engineers Div., EPIC Corp.
   14. Seton Name Plate Co.
   15. Standard Signs, Inc.
   16. W. H. Brady & Co.

17. 3M Scotch Code.

B. Other manufacturers equal in design and function will be considered upon submittal of manufacturer's data.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. General: Provide manufacturer's standard products of categories and types required for each application unless otherwise indicated. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

B. Adhesive Marking Labels for Raceway and Metal-Clad Cable: Pre-printed, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Lighting, Power, Light, Power dc, Air Conditioning, Communications, Control, Fire).

C. Label Size: As follows:
1. Raceways 1-inch and Smaller: 1-1/8-inches high by 4-inches long.
2. Raceways Larger than 1": 1-1/8-inches high by 8-inches long.

D. Color: Black legend on orange background unless otherwise indicated or required by governing regulations.

E. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils. thick by 1-inch to 2-inches in width.

F. Pre-Tensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the raceway or cable.

G. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6-inches wide by 4 mils. thick. Printed legend indicative of general type of underground line below.

H. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letters.

I. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014-inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or number.

J. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with eyelet for fastener.

K. Aluminum-Faced Card Stock Tags: Weather-resistant, 18 point minimum card stock face down both sides with embossable aluminum sheet, 0.002-inch thick, and laminated with moisture-resistant acrylic adhesive. Preprint legend to suit the application, and punch for tie fastener.

L. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2-inches x 2-inches x 19 gage.

M. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 sq. in., or 8-inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners.

N. Baked-Enamel Warning and Caution Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

O. Exterior Metal-Blacked Butyrate Warning and Caution Signs: Weather-resistant, nonfading preprinted cellulose acetate butyrate signs with 20 gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.

P. Fasteners for Plastic Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

Q. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50 lb. minimum tensile strength, and suitable for a temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color coding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC and applicable ANSI standards.

C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

D. Identify Raceways of Certain Systems with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be pre-tensioned, snap-around, colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2-inches wide, completely encircling conduit, and place adjacent bands of two color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40 foot maximum intervals in straight runs. Apply the following colors:
   1. Fire Alarm System: Red.
   2. Fire Suppression Supervisory and Control System: Red and Yellow.
   3. Combined Fire Alarm and Watchmen's Report System: Red and Blue.
   4. Watchmen's Report System: Blue.
   5. Security System: Blue and Yellow.
   6. Civil Defense System: Yellow.
   7. Clock System: Green.
   8. Mechanical and Electrical Supervisory System: Green and Blue.
   9. Telephone System: Green and Yellow.

E. Identify Junction, Pull, and Connection Boxes: Code required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also, label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

F. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16-inches; install a single line marker.

G. Install line marker for underground wiring, both direct buried and in raceway.

H. Conductor Color Coding:
   1. Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

208/120 VOLTS	PHASE	480/277 VOLTS
Black	A	Purple
Red	B	Brown
Blue	C	Yellow
White **	Neutral	Gray **
Green	Ground	Green
* Verify color coding with local ordinances and standards prior to installation. ** Neutral to have stripe to match phase color.		

   2. Use conductors with color factory applied the entire length of the conductors except as follows:
      a. The following field applied color coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6-inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration. Conductors #10 and smaller, color code by means of factory applied, color impregnated insulation. Conductors #8 and larger, color code by means of plastic coated self-sticking markers, colored nylon cable ties, or heat shrink type sleeves, or colored vinyl tape.
      b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3-inches from the terminal and spaced 3-inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

I. Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pullboxes, junction boxes, manholes, and switchboard rooms with ¼-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb. test monofilament line or one-piece self-locking nylon cable ties.

J. Tag or label conductors as follows:
   1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuits numbers.
   2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire homeruns), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by means of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate location where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

3. Match identification markings with designations used in panelboard Shop Drawings. Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

K. Apply warning, caution, and instruction signs and stencils as follows:
   1. Install warning, caution, or instruction signs where required by NEC, by ANSI, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Locations shall include but not be limited to the following:
      a. Doors to electrical rooms.
      b. Electrical equipment rated over 600V.
      c. Doors and enclosures which, when opened, expose electrically energized parts.

      Install engraved, plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.
   2. Emergency Operation Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

L. Install equipment/system circuit/device identification as follows:
   1. Apply equipment identification labels of engraved plastic laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm system, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch high letter on 1-1/2-inches high label (2-inches high where two lines are required), white lettering in black field. Text shall match terminology and number of the Contract Documents and Shop Drawings. Apply labels for each unit of the following categories of electrical equipment:
      Panelboards, electrical cabinets, and enclosures.
      Access doors and panels for concealed electrical items.
      Electrical switchgear and switchboards.
      Motor control centers.
      Motor starters.
      Pushbutton stations.
      Power transfer equipment.
      Contactors.
      Remote controlled switches.
      Dimmers.
      Control devices.
      Transformers.
      Power generating units.
      Telephone switching equipment.
      Clock/program master equipment.
      Call system master station.
      TV/audio monitoring master station.
      Fire alarm master station or control panel.
      Security monitoring master station or control panel.

M. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

N. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

END OF SECTION

SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1– GENERAL

1.1 COMMISSIONING AGENCY

A. The commissioning agency (CA) has been contracted directly with the owner for this project. The CA has overall responsibility for planning and coordinating the commissioning process. However commissioning involves all parties to the design and construction process, including the electrical (Division 26) contractor, and all specialty sub-contractors within Division 26, such as conduits, lights, and major equipment suppliers as required.

1.2 CONTRACTOR RESPONSIBILITY

A. The electrical (Division 26) contractor's responsibilities are defined in Division 01 of the specifications. These responsibilities apply to all specialty sub-contractors and major equipment suppliers within Division 26. Each contractor and supplier shall review Division 01, and their bids shall include for carrying out the work described, as it applies to each Section within the Division 26 specifications, individually and collectively.

B. Lighting Functional Testing/Commissioning Plan: The Contractor shall complete the tasks below to commission the lighting control system and submit written documentation detailing the tasks below. For each task, list the date performed, person completing the task, the initial setting/condition, actions performed, and final setting condition. Submit documentation at or before substantial completion to facilitate obtaining the Certificate of Occupancy.
   1. Ensure all lighting fixtures have lamps installed and are functional.
   2. Test all exit signs, emergency lighting fixtures, and emergency ballasts furnished integral to fixtures.
   3. Ensure all occupancy sensors have been installed and are operational.
   4. Ensure all wall-boxes and scene controllers are installed and operational.
   5. Test each individual device for occupancy sensor ceiling mounted.
   6. Test 10% of devices for occupancy sensor wall mounted.
   7. Verify the following:
      a. Sensors have been located and aimed per the manufacturer's recommendations.
      b. Status indicators on devices are operational and correct.
      c. Devices control lighting fixtures as indicated on drawings.
      d. Time delays have been set as indicated on the drawings.
      e. Movement in adjacent areas and/or cycling of HVAC systems does not false trigger sensors.

PART 2– PRODUCTS: NOT APPLICABLE

PART 3– EXECUTION: NOT APPLICABLE

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This section includes the work required to provide automatic lighting controls, occupant sensing controls, and lighting contactors.

B. This Section includes the following lighting control devices:
   1. Time switches.
   2. Outdoor photoelectric switches.
   3. Switch-box occupancy sensors.
   4. Indoor occupancy sensors.
   5. Multipole contactors.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, in accordance with Section 260500, “General Requirements for Electrical Work.”

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Lighting plan showing location, orientation, and coverage area of each sensor.
   2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined by the NEC, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture's device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture's literature for the device schedule.

B. Time Switches:
   1. Leviton Manufacturing Company, Inc.
   2. Lightolier Controls.
   3. Lithonia Lighting.
   4. Square D.
   5. Watt Stopper.

C. Photoelectric Switches:
   1. Lithonia Lighting.
   2. Novitas, Inc.
   3. Square D.
   4. Watt Stopper.

D. Occupancy Sensors:
   1. Hubbell Lighting.
   2. Leviton Manufacturing Company, Inc.
   3. Lightolier Controls.
   4. Lithonia Lighting.
   5. MYTECH Corp.
   6. Novitas.
   7. Watt Stopper.

E. Contactors:
   1. Eaton.
   2. GE Industrial Systems.
   3. Hubbell Lighting.
   4. Lithonia Lighting.
   5. Square D.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 TIME SWITCHES

A. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.
   1. Contract Configuration: As indicated.
   2. Contact Rating: 30-A inductive or resistive, 240-V ac.

3. Program: Single channel, 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
4. Programs: 2 channels.
    a. For each channel, 8 on-off set points on a 24-hour schedule.
    b. For each channel, 40 on-off operations per week and an annual holiday schedule that overrides the weekly operation on holidays.
    c. For each channel, 40 on-off operation per week, plus 4 seasonal schedules that modify the basic program, and an annual holiday schedule that overrides the weekly operation on holidays.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program on selected channels.
6. Astronomical Time: All channels.
7. Battery Backup: For schedules and time clock.

B. Electromechanical – Dial Time Switches: Type complying with UL 917.
1. Contact Configuration: DPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Circuitry: Allow connection of photoelectric relay as substitute for on and off function of a program.
4. Astronomical time dial.
5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.4 OUTDOOR PHOTOELECTRIC SWITCHES

A. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten load, to operate connected relay, contractor coils, microprocessor input, and complying with UL 773A.
1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

B. Description: Solid state, with DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; and complying with UL 773.
1. Light-Level Monitoring Range: 1.5 to 10 FC (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base. Provide with stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.5 SWITCH-BOX OCCUPANCY SENSORS

A. Description: Dual-technology type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.
   1. Include ground wire.
   2. Automatic time delay and sensitivity adjustment.

2.6 INDOOR OCCUPANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
   1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
   3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
   4. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted though a 1/2-inch (13 mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   5. Indicator: LED, to shown when motion is being detected during testing and normal operation of the sensor.
   6. Bypass Switch: Override the on function in case of sensor failure.
   7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (215 to 2150 lx); keeps lighting off when selected lighting level is present.

B. PIR Type: Ceiling mounting: detect occupancy by sensing a combination of heat and movement in area of coverage.
   1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in.
   2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
   3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.

C. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
   1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch high ceiling.
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot high ceiling.
   4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.
   5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot high ceiling in a corridor not wider than 14 feet.

D. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

2.7 MULTIPOLE CONTACTORS

A. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
   2. Control-Coil Voltage: Match control power source.

B. Contactors shall be 30-amp, 600-volt rated and shall include manual on/off switches for testing and manual control.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Section 260519, “Wire and Cable (600 Volts and Less)”.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 22 AWG, complying with Section 260519, “Wire and Cable (600 Volts and Less)”.

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 16 AWG, complying with Section 260519, “Wire and Cable (600 Volts and Less)”.

D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Section 260519, “Wire and Cable (600 Volts and Less)”.

PART 3– EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer’s written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519, “Wire and Cable (600 Volts and Less)”.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer’s written instructions.

C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. 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 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553, "Electrical Identification".

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
   2. Operation Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purposed.

END OF SECTION

SECTION 262213 - DRY TYPE TRANSFORMERS

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: This section includes the work required to provide dry type transformers.

B. Related Work: This section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. IEEE C57.12.01 and C57.12.94 – Institute of Electrical Electronics Engineers.

B. NEMA – National Electrical Manufacturers Association.

C. UL 506, 1561, and 1562 – Underwriters Laboratories.

D. 2015 / 2018 International Energy Conservation Code (IECC).

1.3 SUBMITTALS

A. Submit manufacturer’s data demonstrating compliance with this Specification.

B. Submit manufacturer’s installation instructions.

C. Submit manufacturer’s description literature and maintenance recommendations.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton.

B. ABB

C. Siemens.

D. Square D.

E. Power Smith.

2.2 DRY TYPE TRANSFORMERS

A. Unless otherwise indicated or scheduled, three-phase transformers shall be 480-volt delta primary and 208/120-volt wye secondary. Transformers 15 kVA and larger, provide a minimum of four (4) 2-1/2% full capacity primary taps. Exact voltages and taps to be as designated on the Drawings or the Transformer Schedule.

B. Insulation Systems:
   1. 2 kVA and Below: 150 degrees C insulation system based upon 80 degrees C maximum temperature rise above 40 degrees C ambient.
   2. 3 to 15 kVA: 185 degrees C insulation based upon 115 degrees C maximum temperature rise above 40 degree C ambient.
   3. 15 kVA and Above: 220 degrees C insulation system based upon 150 degrees C maximum temperature rise above 40 degrees C ambient.
   4. Insulation Materials: Flame retardant, not supporting combustion, as defined by ASTM Standard Test Method D635 and NEMA ST-20.

C. Core and Coil Assemblies:
   1. Core: Constructed of high grade, non-aging silicon steel with high magnetic permeability, low hysteresis, and eddy current losses. Maximum magnetic flux densities shall be maintained substantially below the saturation point. Provide core volume sufficient to allow efficient operation at 10% above highest tap voltage. Clamp and compress core laminations together using structural steel angles.
   2. Transformer Coils: Continuous wound copper conductor.
   3. Units Rated 15 kVA and Below: Encapsulate assembled core and coil in a resin and aggregate mixture, providing a moisture proof and shock resistant seal.
   4. Units Rated Greater than 15 kVA: Impregnate assembled core and coil using non-hydroscopic, thermo-setting varnish and heat cure to seal out moisture. Secure the completed core and coil to the base using vibration absorbing mounts, without metal-to-metal contact between the core and coil and the enclosure.

D. Enclosures:
   1. NEMA 2, ventilated and drip proof, constructed of heavy gauge, cold rolled sheet steel. Transformers 75 kVA and smaller shall be designed so they can be either floor or wall mounted. Transformers above 75 kVA: Floor-mounted design.
   2. Finish: Degreased, cleaned, phosphatized, primed, and finished with a gray, weather-resistance enamel.

E. Maximum temperature of the top of the enclosure shall not exceed 35 degrees C rise above a 40 degrees C ambient.

F. Maximum Sound Levels

KVA RATING	STANDARD	K-4	K-13
0 – 30 KVA	45dB	45dB	45dB
31 – 112.5 KVA	50dB	50dB	50dB
113 – 225 KVA	50dB	55dB	55dB
226 – 300 KVA	55dB	60dB	60dB
301 – 500 KVA	60dB	64dB	64dB

G. Minimum Efficiency Levels

Minimum Nominal Efficiency Levels for Low-Voltage Dry-Type Distribution Transformers

SINGLE-PHASE TRANSFORMERS		THREE-PHASE TRANSFORMERS	
kVA[a]	**EFFICIENCY (%)[b]**	**kVA[a]**	**EFFICCIENCY (%)[b]**
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

a. Kilo Voltage – Amp rating.
b. Nominal efficiencies shall be established in accordance with the DOE 10 CFR 431 test procedure for low-voltage dry-type transformers.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install in accordance with the recommendations of ANSI C57.12.94 and the requirements of NEC.

B. Isolate line and load side terminations using a minimum of 24-inches flexible conduit.

C. Provide NEC clearance from adjacent surfaces.

D. Provide a 3-1/2-inches housekeeping pad at each transformer.

E. Provide vibration isolation at each point of contact with building or supporting members using Korfund Corporation Type EU devices or equivalent.

F. Prior to energizing transformers 50 kVA and above, perform insulation resistance and ratio tests as recommended by ANSI C57.12.94.

END OF SECTION

SECTION 262416 - BRANCH CIRCUIT PANELBOARDS

PART 1– GENERAL

1.1 WORK INCLUDED

A. This Section includes the work required to provide Lighting and Appliance Branch Circuit Panelboards.

1.2 REFERENCES

A. NEMA AB 1 – Molded Case Circuit Breakers

B. NEMA PB 1 – Panelboards.

C. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

D. UL 489 – Molded Case Circuit Breakers.

1.3 SUBMITTALS

A. Submit manufacturer's product data sufficient to demonstrate compliance with the specified and referenced standards of construction and performance.

B. Submit Drawings indicating dimensions, circuit breaker arrangement and ratings, voltage, main, neutral and equipment ground bus ampacity, integrated short circuit ampere rating and enclosure type.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver panelboards in factory-fabricated water-resistant wrapping.

B. Handle panelboards carefully to avoid damage to material components, enclosure and finish.

C. Store in a clean, dry space and protect from the weather.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton.

B. ABB.

C. Siemens.

D. Square D Company.

2.2 PANELBOARD CONSTRUCTION

A. Molded case circuit breaker type panelboards as scheduled.

B. Enclosure: NEMA Type 1 unless otherwise indicated in the Drawings.

C. Box and Cover: Box, dead front cover and trim cover in accordance with NEMA PB-1. Box: Code gauge hot dipped galvanized steel. Dead front cover and trim cover: Code gauge cold rolled steel. Dead front cover to conceal overcurrent devices and line and load terminations. Door in door trim cover with continuous piano hinge covering the dead front and wiring gutters and with multi-point hinged door over interior dead front.

D. Bus: Copper, 1000 amperes/square inch maximum density.

E. Bus Configuration: Sequence bussed, entire length of panel.

F. Equipment Ground Bus: Copper.

G. Neutral Bus: Full capacity.

H. Finish: Exterior and interior steel surfaces cleaned and finished with gray enamel over a rust inhibiting phosphatized coating. Color – ANSI 61 gray.

I. Integrated Equipment Rating: As scheduled in the Drawings, minimum 10,000 amps symmetrical at 208V and minimum 14,000 amps symmetrical at 480V.

J. Panelboards shall be provided with an additional 25 percent of actual circuit requirements as single pole, 20 amp spares.

K. Circuit Directory: Type written and secured to the inside of the trim door with formed bezel and covered with clear plastic protector.

L. Standard of Construction and Performance: Equal to Cutler-Hammer Types Pow-R-Line 1, 1A and 2.

2.3 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. UL listed molded case circuit breakers, conforming to NEMA AB-1, bolt-on type, integral inverse time delay thermal and instantaneous magnetic trip, SWD listed for lighting circuits.

B. Multipole breaker shall be common trip. Handle ties are not permitted.

C. Interrupting Capacity: Equal to or in excess of available short circuit current indicated for panelboard, as scheduled in the Drawings and as specified in paragraph 2.02 I.

D. Standard of Construction and Performance:
   1. 120/240V: Cutler-Hammer Type BAB, QBHW and HBAX.
   2. 277/480V: Cutler-Hammer Type EHD, FDB and FD.

PART 3– EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with manufacturer's written instructions, requirements of the NEC, and NEMA PB 1.1.

B. Anchor firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured.

C. Test each phase under load to verify phase current balance. Configure loads as required to provide phase current imbalance not to exceed 20 percent of the total connected load.

D. Flush Mounted Panelboards: Provide three (3) 3/4-inch conduits with pull wire from each panelboard to an accessible location above ceiling.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: This section includes the work required to provide wiring devices and device plates.

B. Related Work: This is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. NEMA WD-1 – National Electrical Manufacturers Association.

B. NFPA 70-2020 – National Electrical Code (NEC).

C. UL 20, Switches – Underwriters Laboratories.

D. UL 498, Receptacles, Plugs, and Connectors – Underwriters Laboratories.

1.3 SUBMITTALS

A. Submit manufacturer’s data in accordance with Section 260500 demonstrating compliance with this Specification if other than the specified products are provided.

B. Submit a schedule of labeling and colors for devices. Schedule shall include:
   1. Proposed text for each labeled device in accordance with Section 260500.
   2. Room-by-room listing of device and coverplate. The listing may include only those rooms in which the colors are other than the specified color. If there are no deviations from standard, so state.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cooper Wiring Devices.

B. Hubbell.

C. Leviton.

D. Legrand.

2.2 MATERIALS

A. Provide materials and products of the quality established by the manufacturers and catalog numbers listed herein.

B. Schedule of Wiring Devices: Catalog numbers are for devices. Provide device and plate colors as selected by the Architect.

C. Schedule of Devices:

INDUSTRIAL SPECIFICATION GRADE DEVICES

SWITCHES			
TYPE OF SWITCH	**RATING**	**HUBBELL CATALOG NO.**	**LEVITON CATALOG NO.**
Single pole	277-125V-20A	HBL 1221-I	1221-I
Double pole	277-125V-20A	HBL 1222-I	1222-I
Three-way	277-125V-20A	HBL 1223-I	1223-I
Four-way	277-125V-20A	HBL 1224-I	1224-I
Momentary contact SPDT	277-125V-20A	HBL 1557-I	1257-I
Illuminated OFF – SPST	277-125V-15A	HBL 1221-IL	1201-LHI
Illuminated OFF – 3 WAY	277-125V-15A	HBL 1223-IL	57503-I
Illuminated ON – SPST	277-125V-15A	HBL 1221-PL	2221-PL
Illuminated ON – 3 WAY	277-125V-15A	HBL 1223-PL	----
Single pole lock type	277-125V-20A	HBL 1221-L	1221-L
Double pole lock type	277-125V-20A	HBL 1222-L	1222-L
Three-way lock type	277-125V-20A	HBL 1223-L	1223-L
Four-way lock type	277-125V-20A	HBL 1224-L	1224-L

RECEPTACLES			
TYPE OF RECPTACLE	**RATING**	**HUBBELL CATALOG NO.**	**LEVITON CATALOG NO.**
Single	5-20R	HBL 5361-I	5361I
Duplex	5-20R	HBL 5362-I	5362I
Clock Assembly	5-15R	HBL 5261-C	5261-CH
* Single (side wire only)	5-20R	HBL 5241-I	5351I
* Duplex (side wire only)	5-20R	HBL 5242-I	5342I
Duplex, Isolated Ground	5-20R	HBL IG5362-I	5362IG
* For use only when shallow outlet boxes must be used.			

D. Duplex GFCI receptacles shall be NEMA 5-20R, with lock out feature similar to Leviton #8899-I.

E. Duplex TVSS receptacles shall be back and side wired, NEMA 5-20R, 400V suppressed voltage rating, minimum of 18kA per mode of surge current capability, with LED indicator lights and audible alarm, similar to Cooper #5362VS.

F. Emergency powered receptacles and coverplates shall be RED.

G. Schedule of Receptacle Devices by NEMA Configuration: The following schedule defines the NEMA configuration for receptacles that are identified in the Drawings by the alpha type listed in the table.

TYPE	AMP	VOLTS	NEMA	POLE	WIRE	PHASE
A	15	125	5-15	2	3	1
B	20	125	5-20	2	3	1
C	30	125	5-30	2	3	1
D	15	250	6-15	2	3	1
E	20	250	6-20	2	3	1
F	30	250	6-30	2	3	1
G	50	250	6-50	2	3	1
H	15	125/250	14-15	3	4	1
I	20	125/250	14-20	3	4	1
J	30	125/250	14-30	3	4	1
K	50	125/250	14-50	3	4	1
L	20	250	15-20	3	4	3
M	30	250	15-30	3	4	3
N	50	250	15-50	3	4	3
P	20	120/208Y	L21-20	4	5	3
Q	30	120/208Y	L21-30	4	5	3

H. Switch, Receptacle, and Wiring Device Coverplates:
   1. Coverplates, Dry Locations: Specification grade Type 302 stainless steel with brushed satin finish. Color: Coordinate with Architect.
   2. Coverplates, Damp and Wet Locations, Weatherproof, NEMA 3R “While in Use”:
      a. Duplex Receptacle – Vertical Mount: Leviton 5976GY.
      b. Duplex Receptacle – Horizontal Mount: Leviton 5996GY.
      c. GFCI Receptacle – Vertical Mount: Leviton 5977GY.
      d. GFCI Receptacle – Horizontal Mount: Leviton 5997GY.

PART 3– EXECUTION

3.1 INSTALLATION/APPLICATION

A. Cover and Device Plates: Install with edges in continuous contact with finished wall surfaces, without the use of mats or similar devices and within maximum 1/16-inch tolerance in the vertical plane. Plaster (wall board patching compound) fillings around oversized wall openings will not be permitted. Use of oversized plates to cover over-cut wall openings is not permitted without written approval from Engineer. The use of sectional type device plates is not acceptable.

B. Where more than one device occurs in one outlet box, causing 300 volts or more between them, provide a grounded metallic barrier between devices.

C. Provide gang plates for multiple device locations.

D. Ganged and Remote Control Devices: Engrave plates to identify loads served where ganged three or more and where controlling a remote load. Engraving: 3/16-inch Condensed Gothic filled with black enamel. Reference Section 260553.

E. Device Coordination: Provide, for items of equipment furnished under other Divisions or by the Owner, a receptacle compatible with the cord and connector body supplied with the equipment.

F. Wall Switches: Where located adjacent to doors, install on strike side. Install to operate with ON in the up position for vertical mounting and to the left for horizontal mounting.

G. Receptacles: Unless otherwise specified, mount vertically with ground pin up. Where indicated for installation above or below counter tops, install horizontally with neutral blade on top.

H. Device Plates: Provide for each device. Engrave plates where required by these Specifications.

3.2 FIELD QUALITY CONTROL

A. Verify that device openings have been properly finished and are covered completely by the device coverplate. Test each receptacle and verify that each is properly wired and polarized, and will accept a plug. Replace or clean, to the satisfaction of the Owner's Representative, plates and devices damaged or otherwise marred by paint or wall construction and finish materials.

END OF SECTION

SECTION 262800 - OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This Section covers fuses and molded case circuit breakers rated 600 volts or less in panelboards, switchboards, individual enclosures, motor control centers, combination motor starters, busway plug-in units, etc.

B. Related Work: This Section is a Division 26 Specification and as such shall be taken as an integral part of other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. NFPA 70-2020 – National Electrical Code (NEC).

B. Underwriters Laboratories (UL).

C. American National Standards Institute (ANSI).

D. National Electrical Manufacturers Association (NEMA).

1.3 SUBMITTALS

A. Submit in accordance with Section 260500, “General Requirements for Electrical Work”. In addition, submit the following:
   1. Fuses: Submit manufacturer’s data showing fuse name, symbol, voltage rating, UL Class, interrupting capacity, I^2t characteristics and time-current curves.
   2. Circuit Breakers:
      a. Manufacturer’s data demonstrating compliance with Drawings and these Specifications.
      b. Data shall clearly indicate type of breaker, size, trip characteristics, interrupting capacity, accessories, and time-current curves.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fuses:
   1. Bussman Manufacturing Division.
   2. Mersen.
   3. Little Fuse.

B. Breakers:
   1. Eaton.
   2. ABB.
   3. Siemens.
   4. Square D Company.

2.2 MATERIALS

A. Fuses:
   1. Fuses, 600 volts and less, shall meet the following criteria:
      a. Be of same manufacturer.
      b. Fuses rated 1/10 to 600 amperes shall be current limiting UL Class RK5 with time delay. Time delay should be at least 10 seconds at 500 percent of rated amperes.
      c. Fuses rated 601 to 6000 amperes shall be UL Class L with time delay. Time for fuse to open shall be at least 4 seconds at 500 percent of rated amperes.
      d. Motor circuit fuses rated 1/10 to 600 amperes should be sized at 125 percent of motor nameplate FLA or next standard size unless otherwise directed by equipment manufacturer.
      e. Motor circuit fuses rated 601 to 6000 amperes shall be sized between 150 and 175 percent of motor nameplate FLA or next size larger.
      f. Provide one spare set of three of each size and type of fuse rated at more than 600 amperes, and 10 percent of each size and type of fuse rated 600 amperes or less, but in no case less than one set of three of each size.
      g. Provide a cabinet of adequate dimensions to store specified spare fuses. Cabinet shall be of panelboard type construction, having separate labeled compartments for each fuse class and rating. Install cabinet where indicated on Drawings or as directed by Architect.
      h. Fuses for Fluorescent Lamp Ballasts: Bussman Type GLR with Type HLR fuseholder.

B. Circuit Breakers:
   1. Circuit breakers shall:
      a. Have inverse time tripping characteristics with fixed thermal trip action.
      b. Have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
      c. Have variable magnetic trip elements for frame sizes larger than 100 amperes which are set by a single adjustment (to assure uniform tripping characteristics in each pole).
      d. Be magnetic only where indicated. Each breaker shall be provided with a single magnetic adjustment which simultaneously sets the magnetic trip level of each individual pole.
      e. Be calibrated for operation in a minimum ambient temperature of 40 degrees C.
      f. Clearly indicate their current and voltage rating.
      g. Have interrupting capacity compatible with panelboard or switchboard integrated equipment rating.
      h. Have a minimum AIC of 10,000A on 120/208V wye systems, and 14,000A on 277/480V wye systems unless otherwise specified on Drawings.
      i. Be one, two, or three pole molded case circuit breakers as specified on Drawings.
      j. Be common trip type for multi-pole breakers. Wires, pins, etc. between single pole breakers to form common trip will not be acceptable.
      k. Not require more space than equivalent number of single pole breakers when indicated to be a multi-pole breaker.
      l. Have over-center toggle type mechanisms, providing quick-make, quick-break action.
      m. Be “bolted” type when group mounted.
      n. Have operating handle that visually indicates ON, OFF, or TRIPPED condition.
      o. Have reverse connection capability and be suitable for mounting and operating in position.
      p. Have removable lugs. Lugs shall be UL listed for copper and aluminum conductor. Breakers shall be UL listed for installation of mechanical type lugs.

q. Accessories shall be UL listed field replaceable.
r. Be suitable for switching lighting loads when used for switching light circuits and shall be so marked (SWD).

2. Current limiting circuit breakers (where indicated) shall comply with items listed above except as follows:
   a. On high level fault currents, limit peak current and let-thru energy and provide voltage transient-free interruption at near unity power factor. On fault currents below threshold of limitation, provide conventional overload and short circuit protection.
   b. Shall be recognized by Underwriters Laboratories and shall appear in Recognized Component Directory under “Circuit Breakers – Series Connected” product category DKSY2 when combinations for series connected interrupting ratings are used to allow use of branch circuit breakers with lower interrupting capacities on systems capable of delivering fault currents up to 200,000 RMS symmetrical amperes at 480V, A.C. and 100,000 RMS symmetrical amperes at 600V, A.C.
   c. Accessories shall be UL listed, installed, and calibrated at factory to assure proper alignment and operation.

PART 3 – EXECUTION

3.1 INSTALLATION/APPLICATION

A. Provide overcurrent protection for wiring and equipment in accordance with National Electrical Code.

B. Should equipment nameplate data disagree with size or application of an overcurrent protective device indicated on Drawings, it should be brought to the attention of Engineer.

C. Label shall be placed inside each fused, switch door. Label should indicate fuse type, ampere rating, and interrupting rating, and should indicate that fuses should be replaced only with fuses of same class, ampacity, and interrupting rating.

D. Breakers must clear panel doors and be mounted on frame allowing outward and inward adjustment. Depth of panel shall also permit adjustment.

E. Each breaker shall be provided with a numerical designation strip.

F. In general, 120 volt lighting and receptacle circuits shall be fed from 20 ampere single pole breakers. Unless specifically called for or NEC required, breakers less than 20 amperes shall not be allowed.

G. Use of tandem “Multi”, “Push-O-Matic”, or “Quicklag” breakers will not be permitted.

H. Breakers shall have AIC ratings equal to or in excess of available short circuit current indicated for panelboard or switchboard in which they are installed.

I. Fuses shall NOT be shipped in fused switches.

J. Devices shall be stored in a moisture-free area until installed.

END OF SECTION

SECTION 262816 - DISCONNECT SWITCHES

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: This Section includes work required to provide disconnecting means for service entrance, branch and feeder circuits.

B. Related Work: This Section is a Division 26 Specification and as such will be taken as an integral part of all other division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. ANSI/NEMA 250.

B. NEMA KS-1.

C. NFPA 70-2020 – National Electrical Code (NEC).

D. UL 98.

1.3 SUBMITTALS

A. Manufacturer’s Data: Submit manufacturer’s data demonstrating compliance with the Drawings and Specifications in accordance with Section 260500, “General Requirements for Electrical Work”.

B. Maintenance data and operating instructions in accordance with Section 260500, “General Requirements for Electrical Work” if other than the specified products are provided.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton.

B. ABB.

C. Siemens.

D. Square D Company.

2.2 MATERIALS

A. Safety Switches:
   1. NEMA Type HD: Heavy Duty, conforming to NEMA KS-1 and UL 98, quick-make and quick-break type having overcenter toggle action to preclude contact teasing.
   2. Horsepower rated.
   3. Equipped with Class R fuseholders and fuses where indicated to be fusible type.
   4. Dead front construction with removable arc suppressor.
   5. Front removable 60 degrees C./75 degrees C. UL listed copper/aluminum terminals.
   6. Current-carrying parts plated by an electrolytic process.
   7. NEMA enclosure based on ANSI/NEMA 250-1979, suitable for the installed location.

8. Enclosures:
    a. NEMA 1: Code gauge sheet steel, cover equipped with pin type hinges.
    b. NEMA 3R and 12: Code gauge galvanized steel, covers provided with means of securing in the open position.
    c. NEMA 4: Code gauge stainless steel.
    d. NEMA 1, 3R and 12 – Enclosures: Treated with a rust-inhibiting phosphate and finished in gray baked enamel.

B. Toggle Switch Disconnects: Horsepower rated for motor disconnecting means.

C. Receptacles: Horsepower rated for motor circuits.

D. Service Entrance Disconnects: UL listed as “Suitable for Service Equipment” and provided with neutral and equipment ground buses.

PART 3– EXECUTION

3.1 INSTALLATION/APPLICATION

A. Identify with labels in accordance with Section 260500, “General Requirements for Electrical Work”.

B. Provide insulated solid neutral terminal unless otherwise indicated.

C. Install to provide minimum front clear working space as required by NEC Article 110.

D. Install fusible switches at no more than 6’-6” above finished floor to the operating handle in its highest position.

E. Mount in the vertical position with ON position being the up position.

F. In wet locations and outdoors install with a minimum of 1/4-inch clearance between the enclosure and the mounting surface.

G. Provide a label inside of each fused switch indicating the fuse type, ampere rating, and interrupting rating originally specified and installed and indicating that the fuses should be replaced only with the same class of fuse.

H. Motor and Control Circuit Disconnects: Disconnect device shall disconnect simultaneously the control circuits and the power circuits (Reference NEC 430.74).

I. Provide in units installed in series with and on the load side of a variable frequency drive controller, an early break electrical interlock contact, 1 NO/1 NC, 15Amp, 120V.

END OF SECTION

SECTION 263213 - PACKAGED ENGINE GENERATORS

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 packaged diesel-engine generator sets with the following features and accessories:
   1. Battery charger.
   2. Fuel tank.
   3. Engine generator set.
   4. Muffler.
   5. Exhaust piping external to set.
   6. Outdoor enclosure.
   7. Remote annunciator.
   8. Starting batteries.

B. Related Sections include the following:
   1. Division 26 Section “Transfer Switches” for transfer switches, including sensors and relays to initiate automatic-starting and –stopping signals for engine generator sets.

1.3 DEFINITIONS

A. Standby Rating: Power output rating equal to the power the generator set delivers continuously under normally varying load factors for the duration of a power outage.

B. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

C. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.4 SUBMITTALS

A. Product Data: Include data on features, components, ratings, and performance. Include the following:
   1. Dimensioned outline plan and elevation drawings of engine generator set and other components specified.
   2. Thermal damage curve for generator.
   3. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Indicate fabrication details, dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Detail wiring for power and control connections and differentiate between factory-installed and field-installed wiring.

C. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

D. Field Test and Observation Reports: Indicate and interpret test results and inspection records relative to compliance with performance requirements.

E. Certified summary of prototype-unit test report.

F. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

G. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

H. Maintenance Data: For each packaged engine generator and accessories to include in maintenance manuals specified in Division 1. Include the following:
   1. Detail operating instructions for both normal and abnormal conditions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of emergency maintenance and repairs at the Project with eight hours' maximum response time.

B. Source Limitations: Obtain packaged engine generator and auxiliary components specified in this Section through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. Comply with NFPA 70.

E. Comply with NFPA 110 requirements for Level 2 emergency power supply system.

F. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

G. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of the installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver engine generator set and system components to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards.

1.7 WARRANTY

A. General Warranty: Warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2– PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Caterpillar, Inc.; Engine Div.
   2. Generac Corp.
   3. Kohler Co; Generator Division.
   4. Onan Corp; Industrial Business Group.
   5. Stewart & Stevenson Services, Inc.

2.2 ENGINE GENERATOR SET

A. Furnish a coordinated assembly of compatible components.

B. Output Connections: Three phase, four wire.

C. Safety Standard: Comply with ASME B15.1.

D. Nameplates: Each major system component is equipped with a conspicuous nameplate of component manufacturer. Nameplate identifies manufacturer of origin and address, and model and serial number of item.

E. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

F. Skid: Adequate strength and rigidity to maintain alignment of mounted components without depending on a concrete foundation. Skid is free from sharp edges and corners. Lifting attachments are arranged to facilitate lifting with slings without damaging any components.

2.3 GENERATOR-SET PERFORMANCE FOR SENSITIVE LOADS

A. Oversizing generator compared with the rated power output of the engine to meet performance requirements in paragraphs below is permissible.
   1. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

B. Steady-State Voltage Operational Bandwidth: 2 percent of rated output voltage from no load to full load.

C. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

D. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage recovers to remain within the steady-state operating ban within 0.5 second.

E. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.

F. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there are no random speed variations outside the steady-state operational band and no hunting or surging of speed.

G. Transient Frequency Performance: Less than 2-Hz variation for a 50 percent step-load increase or decrease. Frequency recovers to remain within the steady-state operating band within three seconds.

H. Output Waveform: At no load, harmonic content measured line to neutral does not exceed 2 percent total with no slot ripple. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

I. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, the system will supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or any other generator system component.

J. Excitation System: Performance is unaffected by voltage distortion caused by nonlinear load.

K. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 SERVICE CONDITIONS

A. Environmental Conditions: Engine generator system withstands the following environmental conditions without mechanical or electrical damage or degradation of performance capability;
   1. Ambient Temperature: Minus 15 to plus 40 deg C.

2.5 ENGINE

A. Comply with NFPA 37.

B. Fuel: Fuel oil, Grade DF-2.

C. Rated Engine Speed: 1800 rpm.

D. Maximum Piston Speed for Two-Cycle Engines: 1725 fpm (8.8 m/s).

E. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m./s).

F. Lubrication System: Pressurized by a positive-displacement pump driven from engine crankshaft. The following items are mounted on engine or skid:
   1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
   2. Thermostatic Control Valve: Controls flow in system to maintain optimum oil temperature. Unit is capable of full flow and is designed to be fail-safe.
   3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps or siphons or special tools or appliances.

G. Engine Fuel System: Comply with NFPA 37. System includes the following:
   1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
   2. Relief/Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

H. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system.

2.6 GOVERNOR

A. Type: Adjustable isochronous, with speed sensing.

2.7 ENGINE COOLING SYSTEM

A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine generator-set skid and integral engine-driven coolant pump.

B. Radiator: Rated for specified coolant.
   1. Radiator Core Tubes: Nonferrous-metal construction.
   2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
   3. Fan: Driven by multiple belts from engine shaft.

C. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

D. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

E. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
   1. Rating: 50-psig (345-kPa) maximum working pressure with 180 deg f (82 deg C) coolant, and noncollapsible under vacuum.
   2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.8 FUEL SUPPLY SYSTEM

A. Comply with NFPA 30 and NFPA 37.

B. Base-Mounted Fuel Oil Tank: Factory-installed and –piped, listed and labeled fuel oil tank. Features include the following:
   1. Tank level indicator.
   2. Capacity: Fuel for 72 hours' continuous operation at 75 percent rated power output.
   3. Vandal-resistant fill cap.
   4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.9 ENGINE EXHAUST SYSTEM

A. Muffler: Critical type, sized as recommended by engine manufacturer. Measured sound level at a distance of 10 feet (3 m) from exhaust discharge, is 85 dBA or less.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connections from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liners.

2.10 COMBUSTION-AIR-INTAKE

A. Description: Standard-duty engine-mounted air cleaner with replaceable dry filter element and “blocked filter” indicator.

2.11 STARTING SYSTEM

A. Description: 24-V electric, with negative ground and including the following items:
   1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in “Environmental Conditions” Paragraph in “Service Conditions” Article above.
   2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
   3. Cranking Cycle: As required by NFPA 110 for system level specified.
   4. Cranking Cycle: 60 seconds.
   5. Battery: Adequate capacity within ambient temperature range specified in “Environmental Conditions” Paragraph in “Service Conditions” Article above to provide specified cranking cycle at least twice without recharging.
   6. Battery Cable: Size as recommended by generator set manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
   7. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit complies with UL 1236 and includes the following features:
      a. Operation: Equalizing-charging rate of 10 A is initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit then automatically switches to a lower float-charging mode and continues operating in that mode until battery is discharged again.
      b. Automatic Temperature Compensation: Adjusts float and equalizes voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
      c. Automatic Voltage Regulation: Maintains output voltage constant regardless of input voltage variations up to plus or minus 10 percent.
      d. Ammeter and Voltmeter: Flush mounted in door. Meters indicate charging rates.
      e. Safety Functions: Include sensing of abnormally low battery voltage arranged to close contacts providing low battery voltage indication on control and monitoring panel. Also include sensing of high battery voltage and loss of a ac input or dc output of battery charger. Eight condition closed contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
      f. Enclosure and Mounting: NEMA 250, inside outdoor enclosure.

2.12 CONTROL AND MONITORING

A. Functional Description: When the mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic-transfer switches initiate starting and stopping of the generator set. When the mode-selector switch is switched to the on position, the generator set manually starts. The off position of the same switch initiates generator-set shutdown. When the generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages are grouped on a common control and monitoring panel mounted on the generator set. Mounting method isolates the control panel from generator-set vibration.

C. Indicating and Protective Devices and Controls: Include those required by NFPA 110 for a Level 2 system, and the following:
   1. AC voltmeter.
   2. AC ammeter.
   3. AC frequency meter.
   4. DC voltmeter (alternator battery charging).
   5. Engine-coolant temperature gage.
   6. Engine lubricating-oil pressure gage.
   7. Running-time meter.
   8. Ammeter-voltmeter, phase-selector switch(es).
   9. Generator-voltage adjusting rheostat.

D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices, and wiring required to support specified items. Locate sensors and other supporting items on engine, generator, or elsewhere as indicated. Where not indicated, locate to suit manufacturer's standard.

E. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 2 systems. Include necessary contacts and terminals in control and monitoring panel. Locate audible device and silencing means where indicated.

F. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LEDs identify each alarm event. Common audible signal sounds for alarm conditions. Silencing switch in face of panel silences signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

2.13 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Matched to generator thermal damage curve as closely as possible.
   3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
   4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Ground-Fault Indication: Comply with NFPA 70, Article 700-7(d). Integrate ground-fault alarm indication with other generator-set alarm indications.

2.14 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1 and specified performance requirements.

B. Drive: Generator shaft is directly connected to engine shaft. Exciter is rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction prevents mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 119 percent of rated capacity.

F. Excitation uses no slip or collector rings, or brushes, and is arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
   1. Adjusting rheostat on control and monitoring panel provides plus or minus 5 percent adjustment of output- voltage operating band.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.15 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 70 mph. Multiple panels are lockable and provide adequate access to components requiring maintenance. Panels are removable by one person without tools. Instruments and control are mounted within enclosure.

B. Muffler Location: External to enclosure.

C. Engine Cooling Airflow through Enclosure: Adequate to maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified. In system service conditions.

D. Automatic Dampers: At engine cooling air inlet and discharge. Dampers are closed to reduce enclosure heat loss in cold weather when unit is not operating.

2.16 FINISHES

A. Outdoor Enclosures: Manufacturer’s standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.17 SOURCE QUALITY CONTROL

A. Factory Tests: Include Project-specific equipment testing (testing of equipment manufactured specifically for this Project).

B. Project-Specific Equipment Tests: Factory test engine generator set and other system components and accessories before shipment. Perform tests at rated load and power factor. Include the following tests.
   1. Full load run.
   2. Maximum power.
   3. Voltage regulation.

4. Transient and steady-state governing.
5. Single-step load pickup.
6. Safety shutdown.

C. Report factory test results within 10 days of completion of test.

PART 3– EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine roughing-in of cooling-system piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for packaged engine generators. Refer to Division 3 Section “Cast-in-Place Concrete” and Division 26 Section “Basic Electrical Materials and Methods”.

3.3 INSTALLATION

A. Comply with packaged engine generator manufacturers’ written installation and alignment instructions, and with NFPA 110.

B. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
   1. Verify that electrical wiring is installed according to manufacturers’ submittal and installation requirements in Division 16 Sections. Proceed with equipment startup only after wiring installation is satisfactory.

3.4 CONNECTIONS

A. Electrical wiring and connections are specified in Division 26 Sections.

B. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicate, use those specified in UL 486A and UL 486B.

3.5 IDENTIFICATION

A. Identify system components according to Division 26 Section “Electrical Identification”.

3.6 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including electrical connections, and to assist in testing. Report results in writing.

B. Testing:
   1. Engage a qualified independent testing agency to perform field quality-control testing.
   2. Perform field quality-control testing under the supervision of the manufacturer's factory-authorized service representative.

C. Tests: Include the following:
   1. Tests recommended by manufacturer.
   2. InterNational Electrical Testing Association Tests: Perform each visual and mechanical inspection and electrical and mechanical test stated in NETA ATS for emergency engine generator sets, except omit vibration baseline test. Certify compliance with test parameters for tests performed.
   3. NFPA 110 Acceptance Tests: Perform tests require by NFPA 110 that are additional to those specified here including, but not limited to, the following:
      a. Single-step full-load pickup test.
   4. Battery Tests: Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery. Verify acceptance of charge for each element of battery after discharge. Verify measurements are within manufacturer's specifications.
   5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
   6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
   7. Exhaust Emission Test: Comply with applicable government test criteria.
   8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
   9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

F. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 CLEANING

A. On completion of installation, inspect system components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators as specified below:
   1. Coordinate this training with that for transfer switches.
   2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.

3. Review data in maintenance manuals. Refer to Division 1 Section “Contract Closeout”.
4. Review data in maintenance manuals. Refer to Division 1 Section “Operation and Maintenance Data”.
5. Schedule training with Owner, through Architect, with at least seven days’ advance notice.
6. Minimum Instruction Period: Four hours.

END OF SECTION

SECTION 263623 - AUTOMATIC TRANSFER SWITCHES

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 transfer switches rated 600 V and less, including the following:
   1. Automatic transfer switch.
   2. Remote annunciation system.

B. Related Sections include the following:
   1. Division 26 Section 263213 “Packaged Engine Generator Assemblies”.

1.3 SUBMITTALS

A. Product Data: Include ratings and dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

B. Wiring Diagrams: Detail wiring for transfer switches and differentiate between manufacturer-installed and field-installed wiring. Show both power and control wiring.

C. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements and that switches have been tested for load ratings and short-circuit closing and withstand ratings applicable to units for Project.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

E. Field Test Reports: Indicate and interpret test and inspection results for compliance with performance requirements.

F. Maintenance Data: For each type of product to include in maintenance manuals specified in Division 1. Include all feature and operating sequences, both automatic and manual. List all factory settings of relays and provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing emergency maintenance and repairs at the Project with an eight hour maximum response time.

B. Source Limitations: Obtain automatic transfer switch, remote annunciators, and control panels through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008, unless requirements of these Specifications are stricter.

PART 2– PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Caterpillar, Inc.; Engine Division.
   2. Generac Corp.
   3. Kohler Co.
   4. Onan Corp; Electrical Products Division.
   5. Russelectric, Inc.
   6. Zenith Controls, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

C. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels have communications capability matched with remote device.

D. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

E. Resistance to Damage by Voltage Transients: Components meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

G. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6; UL 508, unless otherwise indicated.

H. Factory Wiring: Train and bundle factory wiring and label consistent with Shop Drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.
   1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
   2. Switch Action: Double throw; mechanically held in both directions.

3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units rated 225 A and greater have separate arcing contacts.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is the same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

2.4 AUTOMATIC TRANSFER-SWITCH FEATURES

A. Undervoltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator set. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 9 to 30 minutes; factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source-Available Indicating Lights: Supervise sources via transfer-switch, normal- and emergency-source sensing circuits.
   1. Normal Power Supervision: Green light with nameplate engraved “Normal Source Available”.
   2. Emergency Power Supervision: Red light with nameplate engraved “Emergency Source Available”.

H. Unassigned Auxiliary Contacts: Two normally open single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

I. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

J. Engine Starting Contacts: One isolated, normally closed and one isolated, normally open, rated 10 A at 32-V dc minimum.

K. Engine Shutdown contacts: Time delay adjustable from zero to five minutes; factory set for five minutes. Initiates shutdown at remote engine-generator controls after retransfer of load to normal source.

L. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine-generator set and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
   1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
   2. Push-button programming control with digital display of settings.
   3. Integral battery operation of time switch when normal control power is not available.

2.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel annunciates conditions for indicated transfer switches. Annunciation includes the following:
   1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
   2. Switch position.
   3. Switch in test mode.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.
   1. Indicating Lights: Grouped for each transfer switch monitored.
   2. Label each group indicating transfer switch it monitors, location of switch, and identity of load it serves.
   3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
   4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.6 FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.7 SOURCE QUALITY CONTROL

A. Factory Test Components, Assembled Switches, and Associated Equipment: Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3– EXECUTION

3.1 APPLICATION

A. Four-Pole Switches: Where four-pole switches are indicated, install neutral switching.

3.2 INSTALLATION

A. Floor-Mounted Switch: Level and anchor unit to floor.

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Division 26 Section “Basic Electrical Materials and Methods”.

D. Identify components according to Division 26 Section “Electrical Identification”.

3.3 WIRING TO REMOTE COMPONENTS

A. Match type and number of cables and conductors to control and communications requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

3.4 CONNECTIONS

A. Ground equipment as indicated and as required by NFPA 70l.

3.5 FIELD QUALITY CONTROL

A. Testing: Test transfer-switch products by operating them in all modes. Perform tests recommended by manufacturer under the supervision of manufacturer’s factory-authorized service representative. Correct deficiencies and report results in writing. Record adjustable relay settings.

B. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
   1. Assist in verifying grounding connections and locations and ratings of sensors.
   2. Assist in observing reaction of circuit-interrupting devices when simulated fault current is applied at sensors.

C. Coordinate tests with tests of generator plant and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean equipment internally, on completion of installation, according to manufacturer’s written instructions.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain transfer switches and related equipment as specified below:
   1. Coordinate this training with that for generator equipment.
   2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
   3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout".
   4. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data".
   5. Schedule training with Owner, through Architect, with at least seven days' advance notice.
   6. Provide a minimum of four hours of instruction.

END OF SECTION

SECTION 264100 - LIGHTNING PROTECTION SYSTEM

PART 1– GENERAL

1.1 SUMMARY

A. Description of Work: The work included in this section of the Specifications is the furnishing of a complete lightning protection system and a common grounding system.

B. Related Work: This section is a Division 26 specification and as such will be taken as an integral part of other Division 26 sections, including Section 260500, “General Requirements For Electrical Work.”

1.2 REFERENCE STANDARDS

A. National Electrical Code (NEC).

B. Underwriters Laboratories (UL).

C. National Fire Protection Association (NFPA).

D. Lightning Protection Institute (LPI).

E. Applicable State and Local Codes.

1.3 QUALITY ASSURANCE

A. The system shall be in compliance with the provision of the Lightning Protection Institute Installation Code LPI-175, the NFPA Code 780, and Master Label provisions of the UL Code 96A.

B. The system shall be installed under the direct supervision of a Certified Master Installer (such as American Roofing and Metal in San Antonio or Bonded Lightning Protection in Dallas).

1.4 SUBMITTALS

A. All submittals shall be in accordance with Section 260500.

B. Shop Drawings: Shall be submitted to the Architect/Engineer for approval prior to start of work. If any departures of consequence from the approved Shop Drawings are deemed necessary by the Contractor, details thereof shall be submitted, approved, and obtained before work is resumed and completed.

C. Manufacturer’s installation and maintenance instructions.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The products of the manufacturers listed below are of acceptable quality and may be substituted for the item scheduled, provided the substituted manufacture’s device complies with all physical and performance characteristics of the scheduled device. Performance characteristics are those scheduled on the drawings or listed in the scheduled manufacture’s literature for the device schedule.

Refer to Specifications Section 260500 for additional requirements.

A. Heary Brothers.

B. Robbins Lightning, Inc.

C. Thompson.

2.2 COMPONENTS

A. All components of the system shall conform to the approval requirements of the Underwriters Laboratories, Inc., the National Fire Protection Association, and Lightning Protection Institute. The label or listing of the above mentioned laboratories will be acceptable evidence.

2.3 SYSTEM MATERIALS

A. Shall in general be copper and high copper content bronze castings and shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems. All materials for this system shall be as manufactured by the acceptable manufacturers or approved equal. Materials shall comply in weight, size, and composition for this class and type of structure. The system shall consist of all necessary cables, air terminals, mounting bases, fittings, couplings, connectors, fasteners, etc. as required to give a complete and coordinated system. All cable and all air terminals used shall bear the UL label.

2.4 FITTINGS

A. All fittings except cable holders shall be heavy duty made from bronze castings. Pressure plates made from stamped or pressed metal parts, or fittings utilizing crimp type pressure devices will not be allowed. All bolts, screws, and related type hardware shall be stainless steel.

2.5 ALL CABLE CONDUCTORS

A. Shall be UL listed 28 strands of 17-gauge copper cable weighing not less than 215 lbs. per 1000'.

2.6 AIR TERMINALS

A. Shall be 3/8" x 18" chrome tipped solid copper rod, and shall extend a minimum of 10 inches above the object to be protected. Air terminals shall be placed at or within 2' of corners or edges of main roofs, places at intervals of 20' on centers, maximum on edges of flat roofs, and at 50' intervals on cross runs. The air terminals in the center roof area shall be 3/8" x 48" chrome tipped solid copper with a proper base. All air terminals shall have a two-way path to ground.

PART 3– EXECUTION

3.1 INSTALLATION

A. Installation of the system shall be subject to the approval, inspection, and testing of all authorities with jurisdiction.

B. Conductors: Shall be concealed wherever practical. All main downleads and roof risers shall be concealed within the building walls or columns. Leads to be run in 1-inch PVC plastic conduit with upper ends terminating above top floor lay-in ceiling, with roof cable penetrations made utilizing approved through-roof connectors with copper pitch boxes. Conduit terminations at lower end to be about 6 inches above finished ground level, so as to pinpoint locations during future inspections.

C. Bonding: All metallic objects and systems at roof levels and elsewhere on the structure shall be complete. Primary bonds for metal bodies of conductance shall be bonded with appropriate fittings and full size conductors and shall consist of, but not be limited to, the following: Roof exhaust fans, fresh air intakes, antenna masts for TV, metal stacks, etc.
   1. Metal bodies of inductance located within 6' of a conductor or object with primary bond shall be bonded with secondary cable and fittings. Typical of these are: roof flashings, parapet coping caps, gravel guards, isolated metal building panels or siding, roof drains, down spouts, roof ventilators, exterior balcony handrails, lower level sizeable miscellaneous metals, etc.

D. Roof Penetration: Wherever the conduit penetrates the roof, copper pitch pans shall be furnished by the Lightning Protection Contractor and installed by the Roofing Contractor. Wood nailing blocks shall be furnished and installed by a General Contractor. All patching masonry work shall be furnished and installed by the General Contractor.

E. Ground Connections To Earth: Shall be made with 3/4" x 10' long copper-clad ground rods and shall be driven to a minimum depth of 12' or more as necessary to reach permanent moisture. In addition to artificial grounding, one ground shall be connected with full size conductor to the water system at the point at which the water source enters the building, ahead of the water meter. Also provide common ground connections between the lightning protection system and electric, telephone systems, and all underground metal piping systems including gas and sewer piping.

3.2 RECORD DRAWINGS

A. Following installation, provide corrected installation Drawings for record purposes and for Owner maintenance.

B. Drawings shall be originals, using pencil on reverse sepia as minimum.

3.3 CERTIFICATIONS

A. Installation of the system shall be certified as correct and in accordance with these Specifications. The master installer shall certify in writing on Form LPI-175A, covering jobsite witness of grounding connections, and at completion of job on Form LPI-175B covering post-installation inspection, that system is complete and as specified. The Contractor shall furnish the Owner with the above Certificates of LPI Code Compliance, together with UL Master Label "C" Certificate. The job will not be accepted without these certificates.

END OF SECTION

SECTION 264300 - TRANSIENT VOLTAGE SURGE SUPPRESSION/SURGE PROTECTIVE DEVICE

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the materials and installation requirements for surge protective devices (SPD) for the protection of all AC electrical circuits.

1.2 SUBMITTALS

A. Submit shop drawings and product information for approval and final documentation.

B. Submittals shall include:
   1. Provide full Specification Compliance referencing this specification and indicating compliance. Each paragraph shall be noted with one of the following designations: “C” – Comply, “E” – Exceed, or “D” – Deviate. A description of what has been exceeded or deviated from shall be provided for explanation.
   2. Dimensional drawing of each surge protective device.
   3. UL 1449 4th Edition Listing, Surge Protective Devices, documentation.
   4. UL 1283 Listing, Electromagnetic Interference Filters, documentation.
   5. Short Circuit Current Rating (SCCR).
   6. Voltage Protection Ratings (VPRs) for all modes.
   7. Maximum Continuous Operating Voltage rating (MCOV).
   8. I-nominal rating (I-n).
   9. SPD shall be UL listed Type 1 or Type 2.

C. Minimum of ten (10) year warranty from all events including lightning.

1.3 RELATED STANDARDS

A. NFPA 70-2020 - National Electrical Code (NEC).

B. UL 1283 - Electromagnetic Interference Filters.

C. UL 1449, Fourth Edition – Surge Protective Devices.

D. IEEE C62.41.1 – IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits.

E. IEEE C62.41.2 – IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

F. IEEE C62.45 – IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.

1.4 DELIVERY, STORAGE AND HANDLING

A. Handle and store equipment in accordance with manufacturer’s Installation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide an externally mounted Surge Protective Devices (SPD), formerly called Transient Voltage Surge Suppressors (TVSS). Basis of Design:
   1. ACT Communications.
   2. Southern Tier.
   3. Eaton.
   4. Square D.
   5. Current Technology.
   6. Approved alternate manufacturers pending full spec compliance and approval by the Engineer of Record.

2.2 ELECTRICAL DISTRIBUTION EQUIPMENT

A. Service Entrance:
   1. SPD shall be UL 1449 labeled as Type 1 application, verifiable at UL.com. UL listing SHALL NOT be reliant on an upstream OCPD to provide UL 1449 Listing.
   2. SPD shall be factory installed external to electrical distribution equipment.
   3. Service Entrance SPD shall be UL labeled with 20kA I-nominal (I-n)
   4. Minimum Single Impulse Surge Current Rating shall be 240kA per Mode.
   5. SPD shall be UL labeled with Short Circuit Current Rating (SCCR). Greater than panel being protected.
   6. [Standard 7 Mode Protection: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.]
   7. SPD shall be connected either to the line side of the Main Service Entrance Disconnecting Means or to the Main Service Switchboard or Panel via a 3P-100A or larger breaker.
   8. SPD shall be equipped with an integral disconnect capable of surviving a single 200kA surge current impulse.
   9. SPD shall meet or exceed the following criteria:
      a. Minimum 7-Mode surge current capability shall be 240 kA per mode.
      b. UL 1449 - Fourth Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

Voltage	L-N	L-G	N-G	L-L	MCOV
208Y/120	700V	700V	700V	1000V	150V
480Y/277	1000V	1000V	1000V	1800V	320V

   10. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) for L-N, L-G, and N-G modes of protection (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

   11. SPD shall incorporate a UL 1283 listed EMI/RFI filter.
   12. Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30 mm diameter.
   13. SPD shall include a serviceable, replaceable module. Note that 50kA, 100kA, and 150kA per mode SPD’s may be single piece construction and must be replaced when damaged.

14. SPD shall be equipped with the following diagnostics:
    a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
    b. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
    c. Form C dry contacts.
    d. Dual Surge Event Counters, One counter shall be resettable.
15. SPD shall have a ten (10) year warranty.

B. Distribution Panel
1. SPD shall be UL 1449 labeled Type 1 or Type 2 applications, verifiable at UL.com. UL listing SHALL NOT be reliant on an upstream OCPD to provide UL 1449 Listing.
2. SPD shall be factory installed external to electrical distribution equipment.
3. SPD shall be UL labeled with 20kA I-nominal (I-n)
4. Minimum Single Impulse Surge Current Rating shall be 150kA per Mode.
5. SPD shall be UL labeled with Short Circuit Current Rating (SCCR). Greater than panel being protected.
6. True 7 Mode Protection: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
7. SPD shall be connected to the buss of the distribution equipment with an appropriately sized disconnect.
8. SPD shall meet or exceed the following criteria:
    a. Minimum 7-Mode surge current capability shall be 150 kA per mode.
    b. UL 1449 - Fourth Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

Voltage	L-N	L-G	N-G	L-L	MCOV
208Y/120	700V	700V	700V	1000V	150V
480Y/277	1000V	1000V	1000V	1800V	320V

9. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) for L-N, L-G, and N-G modes of protection (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

10. SPD shall incorporate a UL 1283 listed EMI/RFI filter.
11. Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.
12. SPD shall be equipped with the following diagnostics:
    a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
    b. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
    c. Form C dry contacts.
    d. Dual Surge Event Counters, One counter shall be resettable.

    No other test equipment shall be required for SPD monitoring or testing before or after installation.
13. SPD shall have a minimum ten (10) year warranty.

C. Branch Panels
1. The panelboard shall be UL 1449 labeled as Type 1 or Type 2 applications. UL listing SHALL NOT be reliant on an upstream OCPD to provide UL 1449 Listing.
2. The unit shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.
3. SPD shall be UL labeled with 20kA I-nominal (I-n)

4. Minimum Single Impulse Surge Current Rating shall be 100kA per Mode.
5. SPD shall meet or exceed the following criteria:
   a. Minimum 7-Mode surge current capability shall be 100 kA per mode.
6. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verify at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

7. SPD shall incorporate a UL 1283 listed EMI/RFI filter.
8. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
9. SPD shall be equipped with the following diagnostics:
   a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
   b. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
   c. Form C dry contacts.
   d. Surge Event Counter.
10. SPD shall have a minimum ten (10) year warranty.

D. Enclosure shall be either NEMA 4 for exterior applications or NEMS 1 for interior locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's recommendations and contract documents.

3.2 ADJUSTMENTS AND CLEANING

A. Remove debris from installation site and wipe dust and dirt from all components.

B. Repaint marred and scratched surfaces with touch up paint to match original finish.

3.3 TESTING

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.

B. Upon completion of installation, provide the start-up and testing services of a factory-authorized and factory-trained local, technical service representative. The tests shall include:
   1. Off-line Testing: Impulse injection to verify the system tolerances as well as verification of proper facility neutral-to-ground bond. Compare field test results to factory benchmark test parameters supplied with each individual unit.
   2. On-line Testing: Verify that suppression and filtering paths are operating with 100% protection as well as verification of proper facility neutral-to-ground bond by measuring neutral-to-ground current and voltage and by visual inspection.
   3. Voltage measurements from Line-to-Ground (L-G), Line-to-Neutral (L-N), Line-to-Line (L-L), and Neutral-to-Ground (N-G), taken at the time of the testing procedure.

3.4 DOCUMENTATION AND REPORTING

A. Record results of field testing and compare to factory benchmark test parameters supplied with each individual surge protective device. Indicate that the integrity of neutral-to-ground bonds were verified through testing and visual inspection, and that grounding bonds were observed to be in place.

B. Submit to the Owner's representative and to the Architect/Engineer copies of the startup test results and the factory benchmark testing results for confirmation of proper suppression filter system function, as required by this section. Provide the number of copies as required by Division One and the Electrical General Provisions section; and three copies where not otherwise specified.

3.5 WARRANTY

A. Equipment manufacturer shall warrant the device against failure when installed in compliance with applicable national and local electrical codes and the manufacturer's installation, operation, and maintenance instructions, for a period of not less than ten years. Warranty shall include parts and labor at the site and shall include lightning damage.

END OF SECTION

SECTION 265100 - LIGHTING – INTERIOR

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This Section includes the work required to provide lighting fixtures, ballasts, lamps, automatic lighting controls.

B. Related Work: This Section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. Certified Ballasts Manufacturers Certification (ANSI C82.1, C82.2, C82.3 and C78).

B. IEEE Publication 587 (ANSI C62.41).

C. Illuminating Engineering Society (IES).

D. Underwriters Laboratories – UL 57, 1570, 1571, 1572 and 1574, Lighting Fixtures.

E. Underwriters Laboratories – UL 924, Emergency Lighting and Power Equipment.

1.3 COORDINATION

A. The catalog numbers included in the Fixture Schedule include a specific designation for ceiling types. Review the Architectural Plans and Specifications and provide fixtures compatible with the ceiling type at each installed location. It is the responsibility of the Contractor to coordinate and confirm that each fixture is provided compatible with the installed location.

B. Notify the Architect immediately if fixture placement is discovered to be in conflict with structural members, mechanical duct work, piping systems or any other appurtenance that does not permit installation of each fixture at the installed location.

1.4 SUBMITTALS

A. Submit, in accordance with Section 260500, “General Requirements for Electrical Work”, manufacturer’s data for fixtures, lamps, and controls, demonstrating compliance with this Specification.
   1. Manufacturer’s Data and Shop Drawings.
   2. Certified Test Reports: Candlepower distribution data in horizontal plane at angles of every 10 degrees between 0 degrees and 180 degrees, coefficients of utilization, efficiencies, and distribution class. Testing shall be by an independent testing laboratory. Excerpts of test data on manufacturer’s letterhead are not acceptable.
   3. Lamps: Color temperature, CRI, wattage, lumen maintenance, watts, and lamp life.
   4. Recessed Light Fixtures: Clearly indicate the ceiling type(s) in which fixture may be installed and the specific type of ceiling into which the fixture is to be installed.
   5. Fixture Supporting Devices: Product data and shop drawings.

PART 2– PRODUCTS

2.1 GENERAL

A. Furnish and install the products herein specified and scheduled in the Drawings, including components required to affect the intended installation.

B. Fixtures installed in Damp and Wet Locations, as defined by the National Electrical Code, shall be UL listed for the application.

C. Provide plaster frames for each fixture installed in gypsum board, plaster or stucco ceilings.

2.2 ACCEPTABLE MANUFACTURERS: Products of the following named manufacturers, subject to compliance with the intent of these Specifications, are acceptable.

A. Lighting Fixtures: The Construction Drawings include Lighting Fixture Schedules, in which are listed the acceptable manufacturers for each defined fixture type.

B. Emergency Ballast/Inverter:
1. Bodine.
2. Dualite.

C. Lamps:
1. LED

2.3 COMPONENT EQUIPMENT

A. Lighting Fixtures:
1. The lighting fixtures identified in the Fixture Schedule by manufacturer's catalog number, are selected to define the intended materials of construction, appearance, efficiency of operation, function, and photometric performance. Products of the listed acceptable manufacturers shall be equal in all respects to the specified products. Drivers and LED lamps are provided with fixture.
2. Provide with outlet boxes, hangers, hardware, supports, and canopy extensions as required to accommodate the specified installed condition.
3. Provide complete with lamps of specified size, type, manufacturer, color, and voltage.
4. Provide complete with plaster frames and light tight gaskets when recessed in drywall or plaster ceilings or soffets.

2.4 EMERGENCY BALLAST/INVERTER

A. LED, Lamps:
1. High-temperature, maintenance-free nickel cadmium battery having 24.0 watt/hour capacity, automatic battery charger and component electronic circuitry, charging indicator lamp, test switch encased a red painted finish steel case.
2. Performance Criteria: Capable of operating one LED lamp at 1250 lumens initial light output for a time period of 90 minutes minimum.

2.5 OCCUPANCY SENSORS

A. Provide occupancy sensors and accessory equipment and components as specified, scheduled and detailed in the Drawings. Model numbers of products scheduled in the Drawings are manufactured by Novitas. Products equal in performance and construction by Watt Stopper and My Tech are acceptable.

PART 3– EXECUTION

3.1 FIXTURE SUPPORT AND MOUNTING

A. Install fixtures in accordance with the manufacturer's recommended mounting methods and the provisions of the Specifications and as noted and detailed in the Drawings. Lighting shall be supported from the building structure. The fixtures shall be supported in a manner that will ensure the fixture weight being equally distributed from each support and the fixture remaining in a level position.

B. Support LED fixtures installed recessed in a suspended ceiling system from the building structure with two (2) 12 gauge ceiling wires on diagonal corners of the fixture.

C. Support surface-mounted LED fixtures on suspended ceilings from lightweight channel (16 ga. 3/4-inch x 0.5-inch) above the ceiling attached by nylon tie straps to two members of the ceiling suspension system. Provide a minimum of two (2) support channels for each four-foot fixture.

D. Support surface-mounted fixtures mounted on concrete structure, sheet rock or plaster ceilings or low density acoustical tile ceilings using two (2) 1/4-inch x 1-1/2-inch x 4 metal spaces between fixtures and ceiling. Do not place spacers directly over ballast.

E. Pendant-mounted type fixtures on suspended ceilings, pendants, hanger rods, or conduits used for mounting shall be attached to fixture mounting stud installed on junction box. Junction box shall be attached with lightweight channel (16 ga. 3/4-inch x 5-inch) secured by nylon tie straps to two members of ceiling suspension or box may be secured directly to building structure with threaded rod.

F. Lay out exact locations of fixtures in accordance with Architectural Reflected Ceiling Plans (RCPs).

3.2 INSTALLATION

A. Install fixtures so that no labels are visible under normal operating conditions of the fixture.

B. In fire rated ceilings, install fixtures using UL assemblies appropriate to the ceiling rating and configuration.

C. Install lamps as scheduled and specified in each fixture.

D. Do not remove protective plastic covering over fixture louvers until the final construction review.

E. Use cloth gloves when handling reflector cones, louvers, halogen lamps, glass, sconces and other exposed surfaces of fixtures.

F. Install fixtures in lay-in ceiling in center of tile unless dimensioned otherwise in Reflected Ceiling Plans (RCPs).

G. Provide plaster frames for recessed fixtures in plaster or gypboard ceilings.

H. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

Note: Outlet boxes locations on Drawings are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knock-outs.

3.3 CLEANING AND ADJUSTMENT

A. Clean each fixture free of fingerprints, dust, paint and other contaminants prior to final acceptance.

B. Lamps shall be illuminated and operational at the time of final inspection. Relamp burned out, inoperative, or other lamps not providing 100% output.

3.4 WARRANTY

A. Warrant labor and materials free of defect in manufacture and installation for a minimum of one year from date of final acceptance. Warranty shall cover the full cost of repair or replacement as required to restore function and performance.

END OF SECTION

SECTION 265600 - EXTERIOR LIGHTING FIXTURES

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: This Section includes work required to provide exterior lighting fixtures, ballasts, lamps, and controls.

B. Related Work: This Section is a Division 26 Specification and as such shall be taken as an integral part of all other Division 26 Sections, including Section 260500, “General Requirements for Electrical Work”.

1.2 REFERENCE STANDARDS

A. Certified Ballasts Manufacturers Certification (ANSI C82.1, C82.2, C82.3 and C78).

B. IEEE Publication 587 (ANSI C62.41).

C. Illuminating Engineering Society (IES).

D. Underwriters Laboratories – UL 57, 1570, 1571, 1572 and 1574, Lighting Fixtures.

E. Underwriters Laboratories – UL 844, Lighting Fixtures for Use in Hazardous Locations.

F. Underwriters Laboratories – UL 924, Emergency Lighting and Power Equipment.

G. Underwriters Laboratories – UL 935, Fluorescent Ballasts.

H. Underwriters Laboratories – UL 1029, HID Ballasts.

1.3 SUBMITTALS

A. Submit, in accordance with Section 260500, “General Requirements for Electrical Work”, manufacturer’s data for fixtures, lamps, controls and ballasts, demonstrating compliance with this Specification.
   1. Manufacturer’s Data and Shop Drawings.
   2. Certified Test Reports: Candlepower distribution data in horizontal plane at angles of every 10 degrees between 0 degrees and 180 degrees, coefficients of utilization, efficiencies, and distribution class. Testing shall be by an independent testing laboratory. Excerpts of test data on manufacturer’s letterhead are not acceptable.
   3. Lamps: Color temperature, CRI, wattage, lumen maintenance, watts, and lamp life.
   4. Fixture Supporting Devices: Product Data and Shop Drawings.

B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminary “type” alphabetical order with proposed fixture and accessories clearly indicated on each sheet.

C. Calculations: Submit computer generated calculations of predicted maintained horizontal luminance on site parking areas and site secured perimeter areas based on proposed products. Calculations shall provide a graphic array of calculated illuminance depicting plan geometries and shall assume an overall maintenance factor of 0.85.

1.4 QUALITY ASSURANCE

A. Manufacturer's: Firms regularly engaged in manufacture of exterior lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. NEC Compliance: Comply with NEC as applicable to installation construction of exterior lighting fixtures, lighting poles, standards and luminaries.

C. NEMA Compliance: Comply with applicable portions of NEMA Standard Publications pertaining to general exterior, roadway and parking area lighting units.

D. ANSI and ANSI/IES: Comply with applicable requirements of ANSI and ANSI/IES standards pertaining to exterior lighting fixtures and components.

E. UL Compliance: Provide exterior lighting fixtures which are UL-listed and labeled.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from construction debris and physical damage.

B. Store exterior lighting fixtures in original wrappings in a clean dry location. Protect from weather, dirt, fumes, water, construction debris, and damage.

C. Handle exterior lighting fixtures carefully to prevent damage, breaking and scoring. Do not install damaged fixtures or components; remove units from site and replace with new.

1.6 SEQUENCING AND SCHEDULING

A. Schedule exterior lighting installation with other work to reduce possibility of damage and soiling of fixtures during remainder of construction period.

1.7 MAINTENANCE

A. Maintenance Data: Submit maintenance data and parts list for each exterior lighting fixture and accessory; including "trouble-shooting" maintenance guide. Include that data, product data, and shop drawings in a maintenance manual; in accordance with requirements of Division 1.

B. Extra Stock:
   1. Furnish stock or replacement lamps amounting to 10 percent (but not less than one lamp in each case) to each type and size lamp used in each type fixture. Deliver replacement stock as directed to Owner's storage space, and obtain receipt.

PART 2– PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the manufacturer's indicated herein or on the Lighting Fixture Schedule, unless otherwise noted and as follows:
   1. For lighting fixtures where only one manufacturer is listed, the Electrical Contractor shall provide the product listed. No substitutions will be allowed.
   2. For lighting fixtures where more than one manufacturer is listed, the Electrical Contractor shall select one for each fixture type and shall use that fixture on the entire project.

3. For lighting fixtures where one or more manufacturer is listed followed by “or approved equal”, the Electrical Contractor shall select (one of) the product(s) listed or a substitute product approved by the Engineer as being substantially equal to the product specified and shall use that fixture on the entire project. The Engineer retains the right, however, to require the Contractor to provide products of the manufacturer(s) specified.

2.2 EXTERIOR LIGHTING FIXTURES

A. General: Provide corrosion-resistant, aluminum luminaries of sizes, types and ratings listed in the Lighting Fixture Schedule and indicated on the Drawings. Provide fixtures complete with, but not necessarily limited to, lamps, lamp holders, reflectors, ballasts, starters, wiring and mounting accessories compatible with support system, walls, foundations and earthwork. Provide aiming and positive locking devices in adjustable fixtures, and aiming stop for adjustable lamps. Provide for the dissipation of lamp holder and ballast heat through fixture housings. Provide wire mesh corrosion resistant screens in vent holes of outdoor fixtures.

B. Comply with additional fixture requirements noted on Drawings.

C. Ballasts:
1. General: Ballasts shall comply with all applicable UL, CBM and ANSI standards and shall be UL listed. All ballasts shall be high power factor (H.P.F.) 90% minimum. Capacitors in ballasts shall not have PCB’s. Ballasts shall be warranted against failure due to defects in material and workmanship for a minimum period of one (1) year from date of installation acceptance regardless of the date of manufacture. If the manufacturer’s standard warranty begins at date of manufacture, the Electrical Contractor shall obtain from the ballast manufacturer’s agreement to the preceding specification. Such agreement shall be signed b a person in authority and shall be submitted with shop drawings. All ballasts shall be grounded per NEC Article 410-E.

D. Manufacturer: Ballasts shall be manufactured by Universal Manufacturing Co., Valmont, Inc. or Advance Transformers Co.

E. High-Intensity-Discharge-Lamp Ballasts: Provide HID lamp ballasts, externally fused, capable of operating lamp types with ratings indicted and of starting lamps between -20 degrees F and 105 degrees F; constant wattage auto-transformer type, high power factor, core and coil assembly encapsulated in non-melt resin; provide non-PCB capacitor outside ballast encapsulation for easy field replacement; enclose assembly in drawn aluminum alloy or cast housing(s) with necessary wiring compartments and provisions for electrical connections and devices; mount assembly with necessary hardware and vibration dampers. Provide Type M-101 ballasts for low-voltage (75/70E-17) medium screw base metal halide lamps. Encase ballasts in weather-proof, water-tight enclosures and provide proper outdoor type wiring devices.

F. Lamps:
1. General: All lamps shall be furnished and installed by the Electrical Contractor. Install all lamps at time fixtures are mounted. All burned-out lamps shall be replaced by the Electrical Contractor prior to application for final inspection or before project is accepted by Owner. Lamps listed in the Lighting Fixture Schedule shall take precedence over this specification where they differ.
2. Lighting Sources:
   a. Tungsten-Halogen lamps shall be 130 volt (where available), clear, unless otherwise noted, or sealed prismatic PAR lamps as indicated.
   b. High pressure sodium lamps shall be clear unless otherwise noted as diffused.
3. Manufacturer: All lamps in a source group shall be manufactured by the same manufacturer. Approved manufacturers are General Electric Co., Sylvania or Osram.

G. Lighting Fixture Schedule:
   1. Fixture schedule on the Drawings includes type designation, description, application, lamp information, manufacturer's model or series number, and special requirements such as finishes, built-in receptacles and switches, control devices, etc.
   2. Model or series number specified in the schedule is for identification of type of fixture only to establish basic quality and construction. Exact mounting, lens, ballast type, and other components and features shall conform to the details on the Drawings and shall meet the requirements of this Section of the Specifications.

2.3 LIGHTING STANDARDS AND POLES

A. General: Exterior area lighting units of sizes, types and ratings indicated, complete with, but not limited to, poles/standards, brackets, luminaries and other components and accessories required for complete exterior area lighting systems. Provide Bussman Type "HEB" in-line waterproof fuse holders within each pole access for each phase conductor feeding overhead luminaire(s).

B. Metal Lighting Standards: Provide metal, raceway-type, lighting poles and standards, of sizes and types indicated, comprised of shafts, luminary bracket arms, and tenon joints. Equip with grounding connections readily accessible from handhole access doors; and constructed of the following materials and additional construction features:
   1. Material: Steel.
   2. Configuration: Anchor base type with handhole and cover where indicated.
   3. Finishes: Paint finishes over corrosion resisting coatings.
   4. Metal Lighting Standard Accessories: Provide accessories for metal lighting standards, including anchor bolts, as recommended by standard manufacturer, of sizes and materials needed to fulfill loading and erection application requirements.

PART 3– EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which lighting fixtures are to be installed, and substrate which will support lighting fixtures. Notify Contractor in writing of conditions detrimental to proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF EXTERIOR LIGHTING FIXTURES

A. Install exterior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

C. Fasten electrical lighting fixtures and brackets securely to indicated structural supports; and ensure that installed fixtures are plum and level.

3.3 GROUNDING

A. Provide equipment grounding connections for exterior lighting fixtures. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

A. At the Date of Substantial Completion, replace lamps in exterior lighting fixtures which are observed to be noticeably dimmed after Contactor's use and testing, as judged by the Architect.

3.5 ADJUSTING AND CLEANING

A. Aim adjustable lighting fixtures and lamps as directed by the Engineer in night test of system. Verify that measured illuminance values comply with isolux plot diagram values.

B. Clean lighting fixtures of dirt and debris upon completion of installation.

C. Protect installed fixtures from damage during construction period.

3.6 DEMONSTRATION

A. Upon completion of installation of exterior lighting fixtures, and associated electrical supply circuitry, apply electrical energy to circuitry to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

END OF SECTION

SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes work required to provide a complete fire detection and alarm system in accordance with the applicable codes, ordinances and regulations of the jurisdictions in which the installation is located.

B. "The work required" as defined, includes the following:
   1. Planning and design of the system.
   2. Preparation and submitting installation drawings to, obtain approval of and procuring the necessary permits to execute the work of installation.
   3. Provided equipment, components, appliances and materials in quantity and location that are required to provide a system that complies with the language and intent of this Specification and with the requirements of the authorities having jurisdiction.
   4. Testing of the systems as specified herein and as required by the authorities having jurisdiction.
   5. Written certification that the system is installed in accordance with Fire Alarm Rules of the State of Texas in accordance with applicable codes, ordinances and regulations.

C. The planning, layout and installation of the system shall comply with the following prescriptive codes and standards with requirements dictated by authorities having jurisdiction.
   1. NFPA 72 – 2016.
   2. IBC, IMC and IFC – 2018, including local amendments.
   3. Texas Accessibility Standards (TAS) – Architectural Barriers Act, Article 9102, Texas Civil Statues.

D. Occupancy Classifications(s): Refer to the Architectural Drawings and Specifications for clarification of Group and Occupancy definitions and scope.

E. Related Sections include the following:
   1. Division 21 – Fire Suppression Systems
   2. Division 28 – Fire Protection Systems

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1.5 SUBMITTALS

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

B. Shop Drawings: Show details of graphic annunciator.
   1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
   2. Battery: Sizing calculations.
   3. Floor Plans: Indicate final outlet locations and routings of raceway connections.
   4. Device Address List: Coordinate with final system programming.
   5. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

C. Coordination Drawings: Plans, sections, and elevations drawn to scale and coordinating installation of smoke detectors in ducts and access to them. Show the following near each duct smoke provision of detector installation:
   1. Size and location of ducts, including insulation.
   2. Size and location of piping.
   3. Size and arrangement of structural elements.
   4. Size and location of duct smoke detector, including air-sampling elements.

D. Operating Instructions: For mounting at the FACP.

E. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

H. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.

I. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals", make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

J. Certificate of Completion: Comply with NFPA 72 and State of Texas Fire Alarm Rules.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: An experienced Fire Alarm Planning Superintendent (APS) shall be responsible for the system design and layout. Designer must have a current Electronic Security Association (ESA) Level III Fire Alarm Designer Certification, pass the NICET Level III test or be a Licensed Professional Engineer. Devices shown on MS2 drawings are for coordination purposes only.

B. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project and currently licensed by the State of Texas as a Fire Alarm Installer. Employ on staff (full time) a minimum of one (1) NICET Level 3 Fire Alarm Planner and two (2) NICET Level II Technicians.

C. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for the Project and with a record of successful in-service performance.

D. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

E. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, State of Texas regulations and requirements of authorities having jurisdiction.

F. Comply with NFPA 72.

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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   3. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.
   4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.
   5. Keys and Tools: One extra set for access to locked and tamper-proofed components.

PART 2– PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work includes the following:
   1. Siemens
   2. Edwards Systems Technology; Unit of General Signal
   3. Fire Control Instruments, Inc.
   4. Fire Lite Alarms, Inc.
   5. Notifier; Division of Pittway Corporation
   6. Silent Knight
   7. Simplex/Grinnell

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of Systems: By the FACP.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. Noninterference: A signal on one zone or device shall not prevent the receipt of signals from other zones or devices.

E. System Reset: Manually resettable from the FACP after initiating devices are restored to normal.

F. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

G. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when an open circuit, ground or wire-to-wire short occurs, or an open circuit and a ground occur at the same time in an initiating device circuit, signal line circuit, or notification-appliance circuit.

H. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

I. Smoke detection for zones or detectors with alarm verification initiates the following:
   1. Audible and visible indication of an “alarm verification” signal at the FACP.
   2. Activation of a listed and approved “alarm verification” sequence at the FACP and the detector.
   3. General alarm if the alarm is verified.
   4. Cancellation of the FACP indication and system reset is the alarm is not verified.

J. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. Same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity-adjustment schedule changes are recorded in system memory and are printed out by the system printer.

K. Removal of an alarm-initiating device or a notification appliance initiates the following:
   1. A “trouble” signal indication at the FACP and the annunciator for the device or zone involved.
   2. Recording of the event by the system printer.
   3. Transmission of trouble signal to remote alarm receiving station.

L. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system’s historical memory.

2.3 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of a contrasting color.
   1. Double-action mechanism, requiring two actions, such as a push and a pull, to initiate an alarm.
   2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
   3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false alarm operation.
   4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.
   5. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

2.4 SMOKE DETECTORS

A. General: Include the following features:
   1. Operating Voltage: 24-V dc, nominal.
   2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   3. Plug-In Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
   4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
   5. Sensitivity: Can be tested and adjusted in-place after installation.
   6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   7. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

B. Photoelectric Smoke Detectors: Include the following features::
   1. Sensor: Led or infrared light source with matching silicon-cell receiver.
   2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
   3. Integral Thermal Detector: Fixed-temperature type with 135 degrees F (57 degrees C) setting.

C. Ionization Detector: Include the following features:
   1. Responsive to both visible and invisible products of combustion.
   2. Self-compensating for changes in environmental conditions.

D. Duct Smoke Detector: Photoelectric type.
   1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.
   2. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.5 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 degrees F (57 degrees C) or rate of rise of temperature that exceeds 15 degrees F (8.3 degrees C) per minute, unless otherwise indicated.
   1. Mounting: Plug-in base, interchangeable with smoke detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 degrees F (88 degrees C).
   1. Mounting: Plug-in base, interchangeable with smoke detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.6 NOTIFICATION APPLIANCES

A. Description:
   1. Equip for mounting as indicated by fire alarm designer and have screw terminals for system connections.
   2. Device Color: Coordinate with Architect.

B. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

C. Bells: Electric-vibrating, 24-V dc, under-dome type; with provision for housing the operating mechanism behind the bell. When operating, bells provide a sound-pressure level of 94 dB, measured 10 feet (3 m) from the bell. 10-inch (254 mm) size, unless otherwise indicated. Bells are weatherproof where indicated.

D. Chimes, High-Level Output: Vibrating type, 81 dB minimum rated output.

E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet (3 m) from the horn.

F. Visible Alarm Devices: Synchronized Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word “FIRE” is engraved in minimum 1-inch (25 mm) high letters on the lens.
   1. Rated Light Output: 15/30/75/110 candela as required for the installed quantity and location.
   2. Strobe Leads: Factory connected to screw terminals.

2.7 REMOTE DEVICE LOCATION-INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light near each smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
   1. Electromagnet: Required no more than 3 W to develop 25-lbf (111-N) holding force.
   2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
   3. Rating: 24-V ac or dc.
   4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 CENTRAL FACP

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.
   1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1-inch (25 mm) high. Identify individual components and modules within cabinets with permanent labels.
   2. Mounting: Surface.

B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform the functions of fire alarm systems.

D. Indications: Local, visible and audible signals announce alarm, supervisory and trouble conditions. Each type of audible alarm shall have a different sound.

E. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

F. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components, including annunciation, supervision and control.
   1. Display: A minimum of 80 characters; alarm, supervisory and component status messages; and indicate control commands to be entered into the system for control of smoke detector sensitivity and other parameters.]
   2. Keypad: Arranged to permit entry and execution of programing, display and control commands.

G. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.10 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.
   1. Mounting: Surface, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

C. Graphic Display Panel for Remote Annunciator: Wall-mounted engraved panel indicating the building floor plan with a "You Are Here" designation. Engrave zone, area, and floor designations on the face of the panel.
   1. Materials: Satin-finished stainless steel or brushed aluminum.
   2. Floor Plan Lines: Engraved in the surface and filled with colored paint. Floor plan lines are black and 1/4-inch (6 mm) wide; zone boundaries are red and 1/8-inch (3 mm) wide.
   3. Engraved Legends: 1/4-inch (6 mm) high minimum, in letters filled with red paint.
   4. Mounting: Adjacent to remote annunciator.

2.11 EMERGENCY POWER SUPPLY

A. General: Components include valve-regulated, recombinant lead acid battery; charger; and an automatic transfer switch.
   1. Battery Nominal Life Expectancy: 10 years, minimum.

B. Battery Capacity: Comply with NFPA 72.
   1. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.12 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit-breaker shunt trip for power shutdown.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled under UL 864 and NFPA 72.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted to longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, audible device, or other device requiring protection.
   1. Factory fabricated and furnished by the manufacturer of the device.
   2. Finish: Paint of color to match the protected device.

2.15 WIRE

A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 degrees C, color-coded insulation.
   1. Low-Voltage Circuits: No. 16 AWG, minimum.
   2. Line-Voltage Circuits: No. 12 AWG, minimum.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

C. All fire alarm cable to be red in color.

PART 3– EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connect the FACP with a dedicated circuit breaker, with lockable tabs and red identification label reading “FIRE ALARM”.

B. Manual Pull Stations: Mount semiflush in recessed back boxes.

C. Water-Flow Detectors and Valve Supervisory Switches: Provided by Division 23. Connection for each sprinkler valve station and waterflow required to be supervised. Refer to Plumbing/Fire Protection Drawings for quantity and location.

D. Ceiling-Mounted Smoke Detectors: Not less than 4-inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction. Comply with NFPA 72.

E. Wall-Mounted Smoke Detectors: At least 4-inches (100 mm), but not more than 12-inches (300 mm), below the ceiling. Comply with NFPA 72.

F. Smoke Detectors near Air Registers: Install no closer than 60-inches (1520 mm). Comply with NFPA 72.

G. Duct Smoke Detectors: Comply with manufacturer’s written instructions and NFPA 72. Provide in quantity and location as referred by the provided equipment.
   1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   2. Install sampling tubes so they extend the full width of the duct.

H. Fire/Smoke Dampers: Provided by Division 23. Connect to each as required by the Sequence of Operation and the requirements of Division 23 Control Systems. Provide smoke detectors in quantity and location as required to comply with UBC 713.10, IBC 716.3.2.1, IBC 716.3.3.3, and NFPA 72. Reference mechanical (HVAC) systems’ Drawings and Specification for the quantity and location of damper devices.

I. Audible Alarm-Indicating Devices: Install not less than 6-inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

J. Visible Alarm-Indicating Devices: Install in accordance with NFPA 72 and Texas Accessibility Standards.

K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

L. FACP: Surface mount with tops of cabinets not more than 72-inches (1830 mm) above the finished floor.

M. Annunciator: Install with the top of the panel not more than 72-inches (1830 mm) above the finished floor.

3.2 WIRING INSTALLATION

A. Wiring Method:
   1. Metal raceway, conforming to requirements of Division 26 Specifications required in the following locations:
      a. Mechanical Equipment Rooms;
      b. Damp and wet locations;
      c. Underfloor crawl spaces;
      d. Locations exposed to physical damage;
      e. In finished area locations where installation will be exposed, such as with open ceilings;
      f. Above ceilings that do not permit ready access; and
      g. Locations concealed within partitions during construction.

   2. Open wiring permitted in locations where metal raceway systems are not required by Specifications or applicable codes.

B. Wiring Within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable routing, where open wiring systems permitted, shall meet the following installation requirements:
   1. Horizontal Cables:
      a. Routed down left or right side of corridors;
      b. Located within j-hooks spaced every four to five feet;
      c. Located within separate j-hooks from other system cables;
      d. Routed minimum of 24-inches from electrical power conduits and, where crossing is required, at 90 degree angle to electrical power conduits;
      e. Routed minimum of 10 feet from electrical power conduits or equipment with voltages exceeding 480 V rms; and directed into and out of corridors at 90 degree angle to corridor.

2. J-Hook Supports:
    a. Structurally independent of components and supports of suspended ceilings, conduits, pipe, and ductwork;
    b. Filled not more than 40 percent of capacity; and located every four to five feet with at least 3-inches of clear vertical space above ceiling tiles and support channels.
3. Cable Dressing: Neatly bundled and secured with Velcro Fire Wraps installed loosely around cable bundles.

D. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25 mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section 260553 “Electrical Identification”.

B. Install instructions frame in a location visible from the FACP.

C. Provide circuit breaker with lockable tabs and red label at reading “FIRE ALARM”.

3.4 GROUNDING

A. Ground cable shields and equipment according to system manufacturer’s written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 26 Section 260526 “Grounding”.

3.5 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
   1. Verify the absence of unwanted voltages between circuit conductors and ground.
   2. Test conductors for short circuits using an insulation-testing device.
   3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
   4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
   5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
   6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
   7. Test the system for specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
   8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Tag each equipment, stations, and other components at which tests have been satisfactorily completed.

3.6 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
   1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training, two sessions of 4 hours, at times scheduled by the Owner.
   2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

B. Perform tests and system demonstrations as required by the authorities having jurisdiction.

3.8 SYSTEM CERTIFICATION

A. In accordance with Texas Insurance Code, Fire Alarm Rules, at the completion of installation and testing, complete and present on installation certificate to the Owner or his representative.

3.9 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

3.10 WARRANTY/SERVICES

A. Warrant the system free of defects including programming software for a period described in the Contract General Conditions, but not less than one year. This period shall begin upon satisfactory completion and certification of final acceptance testing of the system. Provide to Owner a letter stating the start-date and end-date of warranty period. Provide an updated list of name(s) and phone number(s) for normal and off-hours contacts necessary to respond to warranty issues. Response to warranty notification shall require a reply within 24 hours of initial contact.

END OF SECTION

CLEARING, GRUBBING AND STRIPPING
SECTION 31 10 00

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary to complete the clearing, grubbing and stripping as indicated by the drawings and as specified herein and shall include removing and disposing of all trees, stumps, brush, roots, logs, vegetation, rubbish and other objectionable matter from the project area.

PART 2 – PRODUCTS

PART 3 – EXECUTION

3.1 CLEARING

A. Clear the project site of all trees, stumps, brush, roots, logs, vegetation, rubbish, and objectionable material.

3.2 GRUBBING

A. Grub all stumps and roots to a depth of two and one half feet below natural ground.

3.3 STRIPPING

A. Stripping all area, which underlie compacted fill, of all humus, vegetation or other unsuitable materials encountered within the top 6 inches of soil.

3.4 DISPOSAL

A. Remove all materials from the clearing, grubbing, and stripping operation from the site when no disposal area is shown on the drawings. Burning will be allowed when not in violation with local ordinances; however, Contractor shall be held responsible for any fires or accidents resulting from this operation.

END OF SECTION 31 10 00

SITE EXCAVATION AND FILL
SECTION 31 20 00

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary for excavation and fill required to obtain the finished site grades shown on the drawings necessary to complete the project.

PART 2 - PRODUCTS

2.1 No excavated asphalt, base material, concrete, masonry, rock, trees, stumps and roots shall be used for fill unless authorized in writing by the Engineer. Only excavated material suitable for the purpose shall be used as fill.

2.2 BALANCE OF CUT AND FILL

A. The excavation (of suitable material) and fill does not balance. The Contractor shall haul in or off material as is necessary to provide the grades shown on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall accomplish all site excavation as required to conform to the grades and sections shown on the drawings. The Contractor shall use suitable material taken from the site excavation, street excavation and excess ditch excavation to fill the site as required to conform to the grades and sections shown on the drawings.

3.2 TOP SOIL

A. The Contractor shall schedule his operation so that the majority of the top soil excavated will be spread as the top layer of fill.

3.3 COMPACTION OF FILL: See Section 31 23 23 “Compacted Embankment”.

3.4 SHAPING AND GRADING: See Section 31 22 13 "Site Grading".

END OF SECTION 31 20 00

SITE GRADING
SECTION 31 22 13

PART 1 – DESCRITION

1.1 SCOPE

A. This specification shall govern for all work necessary to accomplish shaping and grading indicated on the drawings and specified herein and shall include maintaining surface drainage during construction, finish grading and all phases of the cleanup operation. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 GENERAL

A. The Contractor shall uniformly grade the entire project site to provide a pleasing appearance.

PART 3 – EXECUTION

3.1 FINISHING SLOPES AND SURFACES

A. The Contractor shall shape and grade the project site to conform to the proposed grade and/or sections shown on the drawings, and as directed by the Engineer. In any case, the Contractor shall grade the site to provide positive drainage away from buildings and towards roads and drainage facilities. The finished appearance shall be reasonably smooth and even (abrupt changes in slope shall not be used). The degree of finish for grading slopes shall be that ordinarily obtainable either from blade-grader operations, or by hand-shovel operations, as the Contractor may elect, subject to the approval of the Engineer.

Adjust any existing or new valve boxes, manhole rims, etc. to new final grades and pour concrete pads as shown in details provided in drawings.

3.2 CLEAN-UP

A. The Contractor shall keep the site and structures free from accumulations of waste materials, debris, etc. caused by the work or his employees. Upon completion of the project and before requesting final inspection, the site and his work shall be "broom clean" or its equivalent.

END OF SECTION 31 22 13

STRUCTURAL EXCAVATION AND BACKFILL
SECTION 31 23 00

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary to accomplish the structural excavation required to complete the project.

PART 2 – PRODUCTS

2.1 Structural excavation shall include all material encountered including earth, asphalt, base material, concrete, masonry, rock, trees, stumps, and roots.

2.2 STRUCTURAL EXCAVATION EXCEEDING 5 FEET IN DEPTH

A. Excavation Safety:
The Contractor's excavation safety procedures shall, in all respects, meet the current standards established by the U. S. Department of Labor, Occupational Safety and Health Administration (OSHA) on excavation, trenching and shoring.

B. Responsibility:
Contractor has the sole and exclusive responsibility for the sufficiency of the trench excavation safety systems utilized. The Contractor shall specifically agree that neither the Owner nor the Engineer has such responsibility, and Contractor will not rely on the Owner or the Engineer or any of their representatives for inspection, design, supervision, construction or any other aspect of trench excavation safety protection. Contractor shall fully indemnify, safe and hold harmless Owner and Engineer, their employees and agents (hereinafter the Indemnities) against any and all liability, damage, loss, claims, demands and actions of any nature whatsoever on account of personal injuries (including, without limitation on the foregoing, workers' compensation and death claims), or property loss or damage of any kind whatsoever, which arise out of or are in any manner connected with, or are claimed to arise out of or be in any way connected with, the negligence of the Contractor in the inspection, design, engineering, supervision, construction, safety devices or other activity connected with the trench excavation safety protection under this Agreement. Contractor shall, at his own expense, investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims demands, and actions.

2.3 STRUCTURAL EXCAVATION 5 FEET OR LESS IN DEPTH

A. General:
The limit of excavation shall be such to allow for placing and removing forms, installing sheeting, shoring, bracing, etc. The Contractor shall pile excavated material in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear.

B. Vertical Sides:
When necessary to protect existing or proposed structures or other improvements, the Contractor shall maintain vertical sides of the excavation. The limit shall not exceed three feet outside the footing on a vertical plane parallel to the footing except where specifically approved otherwise by the Engineer. The Contractor shall provide and install any sheeting, shoring and bracing as necessary to provide a safe work area as required to protect workmen, structures, equipment, trees, etc. The Contractor shall be responsible for the design and adequacy of all sheeting, shoring, and bracing. The sheeting, shoring, and bracing shall be removed as the excavation is backfilled in such a manner as to prevent injurious caving.

C. Sloping Sides:
Where sufficient space is available, the Contractor shall be allowed to back slope the sides of the excavation. The back slope shall be such that the excavation shall be safe from caving. The type of material being excavated shall govern the back slope used. The Contractor shall be responsible for determining the back slope used, but in any case the back slope shall be no steeper than 1 foot horizontal to 1 foot vertical.

PART 3 – EXECUTION

3.1 DEWATERING

A. The Contractor shall keep the excavation free from water by use of cofferdams, bailing, pumping, well point, or any combination as the particular situation may warrant. All dewatering devices shall be installed

in such a manner as to provide clearance for construction, removal of forms, and inspection of exterior of form work. It is the intent of these specifications that the foundation be placed on a firm dry bed. The foundation bed shall be kept in a dewatered condition a sufficient period of time to insure the safety of the structure, but in no case shall dewatering be terminated sooner than 7 days after placing concrete. All dewatering methods and procedures are subject to the approval of the Engineer. The excavation shall be protected from excessive rainfall and drying. The excavation shall be inspected and approved by the Engineer before work on the structure is started. It is the intent of these specifications that the Contractor provide a relatively smooth, firm foundation bed for footings and slabs that bear directly on the undisturbed earth without additional cost to the Owner, regardless of the soil conditions encountered. The Engineer will be the judge as to whether these conditions have been met. The Contractor shall pile excavated material in a manner that will not endanger the work.

3.2 UNAUTHORIZED OVER- EXCAVATION

A. Excavation for slabs, footings, etc., that bear on earth shall not be carried below the elevation shown on the drawings. In the event the excavation is carried on below the indicated elevation, the Contractor shall bring the slab, footing, etc., to the required grade by filling with concrete having a minimum compressive strength of at least 3000 psi. at 28 days. See Subsection 03 30 02 Normal Weight Aggregate Concrete.

3.3 BACKFILL MATERIAL

A. General:
Suitable material chosen from the excavation shall be used for backfill. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer. Backfill material shall be free of vegetation or other extraneous material. Excavated materials which are to be used for fill or backfill may be stockpiled on the site. Location of stockpiles shall be approved by the Engineer. Top soil should be stockpiled separately and used for finish grading around structure.

B. Fiberglass Manholes and Wet Wells:
Sand shall be used for backfill around manholes and/or wet wells for a distance of 2 feet from the outside surface and extending from the bottom of the excavation to the bottom of the top slab. Suitable material (as set out above) chosen from the excavation may be used for the remainder of the backfill. Location of stockpiles shall be approved by the Engineer.

3.4 SCHEDILE OF BACKFILLING

A. Concrete and Masonry Structures:

The Contractor shall begin backfilling of concrete structures no sooner than 7 days but no later than 14 days, after they are cast. The Contractor shall backfill brick and mortar structures after they have been in place at least 3 days.

B. Fiberglass Manholes and Wet Wells:
The Contractor may begin backfilling of manholes and/or wet wells as soon as the concrete has been allowed to cure and any forms are removed.

3.5 BACKFILL

A. General:
Backfill shall be placed in layers of not more than 9 inches (loose measure) and mechanically tamped to at least 95% Standard Proctor Density - A.S.T.M. Specification D-698. Flooding will <u>not</u> be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

B. Fiberglass Manholes and Wet Wells:
Backfill shall be placed in layers of not more than 6 inches (loose measure) and mechanically tamped to at least 95% Standard Proctor Density. Flooding will <u>not</u> be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

3.6 EXCESS AND UNSUITABLE MATERIAL

A. All excess and/or unsuitable excavated material shall be loaded and hauled off the Contractor.

END OF SECTION 31 23 00

PIPE TRENCH EXCAVATION AND BACKFILL
SECTION 31 23 16.13

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to accomplish the pipe trench excavation for all piping required to complete the project. This specification is a performance specification as defined in Section 00 70 00 General Conditions, Subsection Supplemental General Conditions, Art. SC-1 Definitions.

PART 2- PRODUCTS

2.1 MATERIAL

A. Trench excavation shall include all material encountered including dirt, asphalt, base material, concrete, masonry, rock, trees, stumps and roots. Trench excavation will not be measured.

2.2 TRENCHES EXCEEDING 5 FEET IN DEPTH

A. Trench Excavation Safety
The Contractor's trench excavation safety procedures shall, in all respects, meet the current standards established by the U. S. Department of Labor, Occupational Safety and Health Administration (OSHA) on excavation, trenching and shoring.

B. Responsibility
Contractor has the sole and exclusive responsibility for the sufficiency of the trench excavation safety systems utilized. The Contractor shall specifically agree that neither the Owner nor the Engineer has such responsibility, and Contractor will not rely on the Owner or the Engineer or any of their representatives for inspection, design, supervision, construction or any other aspect of trench excavation safety protection. Contractor shall fully indemnify, safe and hold harmless Owner and Engineer, their employees and agents (hereinafter the Indemnities) against any and all liability, damage, loss, claims, demands and actions of any nature whatsoever on account of personal injuries (including, without limitation on the foregoing, workers' compensation and death claims), or property loss or damage of any kind whatsoever, which arise out of or are in any manner connected with, or are claimed to arise out of or be in any way connected with, the negligence of the Contractor in the inspection, design, engineering, supervision, construction, safety devices or other activity connected with the trench excavation safety protection under this Agreement. Contractor shall, at his own expense, investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims demands, and actions.

2.3 TRENCHES 5 FEET OR LESS IN DEPTH

A. The Contractor shall maintain vertical sides of the trench. The minimum and maximum width of trench is set out on the Drawings. The Contractor shall provide and install any sheeting, shoring and bracing as necessary to provide a safe work area as required to protect workmen, structures, equipment, trees, etc. The Contractor shall be responsible for the design and adequacy of all shoring, bracing and sheeting. The Contractor shall remove shoring, bracing and sheeting, as the excavation is backfilled, in such a manner as to prevent injurious caving.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall schedule the excavation of pipe trenches at such times and in such sequence as to present the least interference with other items of the work and the operation of the existing facilities. The Contractor shall pile excavated material in a manner that will not endanger the work, and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear.

3.2 UNAUTHORIZED OVER-EXCAVATION

A. If the Contractor should excavate below the proposed trench grade (without authorization of the Engineer) the Contractor shall correct the grade by filling in with sand and tamping thoroughly as directed by the Engineer.

3.3 TREES, STUMPS, OR ROOTS

A. Where trees, stumps or roots are encountered, they shall be removed and disposed of by the Contractor. Roots shall be cut off flush with the sides of the trench.

3.4 ROCKS, BOULDERS, EXISTING STRUCTURES, ETC

A. Where rocks, boulders, existing structures, or other unsuitable soil conditions are encountered, they shall be removed by the Contractor to a depth of 12 inches below the grade line for the full width of the trench and refilled with sand and tamped thoroughly as directed by the Engineer.

3.5 MAINTENANCE OF FLOW IN SEWERS AND DRAINS

A. The Contractor shall make adequate provision for maintaining the flow of sewers and drains encountered during construction.

3.6 DEWATERING

A. The Contractor shall keep the pipe trench free from water by use of bailing, pumping, well points or any combination as the particular situation may warrant. It is the intent of these specifications to install pipe on a firm dry bed. All dewatering methods and procedures are subject to the approval of the Engineer. The cessation of the dewatering operation will be accomplished during a sufficient period of time to insure that there is no displacement of the pipe due to unequal hydrostatic pressure.

3.7 UNSTABLE TRENCH BOTTOM

A. When the soil encountered at the established bedding grade is a quicksand, muck or similar unsuitable material, the Contractor shall proceed as follows: All unstable soil shall be removed to a depth of 2 feet below bottom of pipe for pipe 2 feet or more in diameter, and to a depth equal to the diameter of pipe for pipe less than 2 feet in diameter. Such excavation shall be carried at least one foot beyond the horizontal limits of the structure on all sides. All unstable soil so removed shall be replaced with suitable stable material, placed in uniform layers of suitable depth as directed by the Engineer, and each layer shall be wetted, if necessary, and compacted by tamping as required to provide a stable foundation for the structure. Soil which is considered to be of sufficient stability to sustain properly the adjacent sections of the roadway embankment will be considered a suitable foundation material for the pipe.

3.8 UNYIELDING TRENCH BOTTOM

A. When the soil encountered at the established bedding grade is ledge rock, rocky or gravelly soil, hard pan or other unyielding material, such materials shall be removed prior to bedding the pipe. These materials shall be excavated for a minimum of 6 inches below the bottom of the pipe and shall be replaced with sand.

3.9 SHAPING TRENCH BOTTOM

A. The bottom of the trench shall be shaped to support the bottom quadrant uniformly and for its entire length. Provide bell holes for couplings. The pipe shall be bedded in a foundation of stable material accurately shaped to fit the lower part of the pipe exterior.

3.10 SAND FOR ENCASEMENT, EMBEDMENT, AND/OR HAUNCHING

A. When the drawings require sand for encasement, haunching and/or embedment, the material shall be screened, free of foreign material and be a finely divided sand as follows:

Sand Specifications:

Passing 7/8" Sieve:	100% by weight
Passing No. 4 Sieve:	80% by weight
Clay Lumps not to Exceed:	20% by weight
Plasticity Index:	NP-10 max.

3.11 CRUSHED STONE FOR HAUNCHING AND/OR EMBEDMENT

A. When the drawings require crushed stone for haunching and/or embedment, the material used shall be angular crushed stone, in the general size range of 3/4" to 1/16" which has good stability. Crushed stone shall be graded in accordance with Size #67 or #68 of AASHO M 43, ASTM D 448.

3.12 CONCRETE EMBEDMENT

A. When concrete embedment is required on the drawings, the concrete shall conform to Section 03 30 02 "Normal Weight Aggregate Concrete". Concrete embedment shall be allowed to cure for at least 24 hours before placing initial backfill and at least 48 hours before placing final backfill unless approved otherwise by the Engineer.

3.13 BACKFILL MATERIAL

A. General:

Unless shown otherwise on the drawings, suitable material chosen from the excavation shall be used for backfill. The material chosen shall be free of large lumps, or clods, which will not readily break down under compaction. Backfill material shall be free of vegetation or other extraneous material. Material will be subject to approval by the Engineer. In areas not under existing or proposed pavement, the last 6 inches of backfill shall be topsoil.

B. Select Backfill Material:
When "select" backfill material is shown on the drawings, it shall be granular in nature, free of large clods, and have a plasticity index (P.I.) of less than 15.

3.14 INITIAL BACKFILL

A. Initial backfill is defined as that backfill from the bottom of the trench (or from the top of the haunching when shown on the drawings) to 1 foot above the top of the pipe. The Contractor shall place initial backfill in maximum 8-inch layers (loose measure) and mechanically compact it to a density between 90% and 95% of the maximum density as determined by ASTM D-698 with a moisture content near optimum. Backfill below the top of the pipe shall be placed and compacted along the sides of the pipe equally to prevent strain on or displacement of the pipe.

3.15 FINAL BACKFILL

A. General:
Final backfill is defined as that backfill from 1 foot above the top of the pipe to finished subgrade or ground line. See the drawings for locations where final backfill is mechanically tamped or water tamped.

B. Mechanically Tamped:
The Contractor shall place final backfill in maximum 8-inch layers (loose measure) and mechanically compact it to a density between 90% and 95% of the maximum density ASTM D-698 with a moisture content near optimum.

C. Water Tamped:
The Contractor shall place final backfill to a level of 18 inches below the surface of the ground. Backfill will be consolidated by jetting. When jetting, selected excavated material shall be placed in layers of not more than 6 to 8 feet in depth and jetted until all settlement ceases. Water jets shall be long enough to reach through the material being tamped. It is the intent of these specifications that water tamping shall continue until all cavities have been eliminated and the material is completely consolidated. After the jetting is completed to the satisfaction of the Engineer, the remaining 18 inches shall be placed in two equal layers and mechanically tamped to at least 90% Standard Proctor Density ASTM D-698.

3.16 EXCESS AND UNSUITABLE MATERIAL

A. All excess and/or unsuitable excavated material shall be loaded and hauled from the project site by the Contractor.

END OF SECTION 31 23 16.13

COMPACTED EMBANKMENT
SECTION 31 23 23

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to place and compact all suitable materials obtained from street, storm sewer, channel and structural excavation for utilization in the construction of street or roadway embankments, dikes, levees, backfill of structures and retaining walls as required to complete the project. This specification is a performance specification as defined in Section 00 70 00 General Conditions, Subsection “Supplemental General Conditions”, Art. SC-1 Definitions.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Material used for embankment shall be free from muck, trees, stumps, brush, roots, rubbish and in all ways be suitable for embankment.

PART - 3 EXECUTION

3.1 GENERAL

A. Prior to placing any embankment, the surface of the ground, including plowed, loosened ground, or surface roughened by small washes or otherwise, shall be restored to approximately its original slope by blading or other methods and where indicated on plans or required by the Engineer the ground surface thus prepared shall be compacted by sprinkling and rolling. Where indicated on plans or directed by the Engineer, the surface of hillsides to receive embankment shall be loosened by scarifying or plowing to a depth of not less than 4 inches, or cut into steps before embankment materials are placed. The embankment shall then be placed in layers, as hereinafter specified, beginning at the low side in part width layers and increasing the widths as the embankment is raised. The materials which have been loosened shall be recompacted simultaneously with the embankment material placed at the same elevation. Where embankments are to be placed adjacent to or over existing roadbeds, the roadbed slopes shall be plowed or scarified to a depth of not less than 4 inches and the embankment built up in successive layers, as hereinafter specified, to the level of the old roadbed shall before its height is increased. Then, if directed, the top of the old roadbed shall be scarified and recompacted with the next layer of the new embankment. The total depth of the scarified and added material shall not exceed the permissible depth of layer. Trees, stumps, roots, vegetation, or other unsuitable materials shall not be placed in embankment. Embankments shall be constructed to the grades shown on the drawings. After completion, it shall be continuously maintained at its finished section and grade until the project is accepted. Except as otherwise specified, earth embankments shall be constructed in successive layers for the full width of the cross section and in such lengths as are suited to the sprinkling and compaction methods utilized. Prior to compaction, the layers shall not exceed 6 inches in depth. Layers of embankment may be formed by utilizing equipment which will spread the material as it is dumped, or they may be formed by being spread by blading or other acceptable methods from piles of windrows dumped from excavating or hauling equipment in such amounts that material is evenly distributed. Each layer of embankment shall be uniform as to material, density and moisture content before beginning compaction. Where non-uniform layers abut each other, each layer shall be feather-edged for at least 100 feet or the material shall be so mixed as to prevent abrupt changes in the soil. No material placed in the embankment by dumping in a pile or windrow shall be

incorporated in a layer in that position, but all such piles or windrows shall be broken and the embankment material mixed by blading, harrowing or similar methods to the end that a uniform material or uniform density is secured in each layer. Water required for sprinkling to bring the material to the moisture content necessary for maximum compaction shall be evenly applied, and it shall be the responsibility of the Contractor to secure a uniform moisture content throughout the layer by such methods as may be necessary. In order to facilitate uniform wetting of the embankment material, the Contractor may apply water at the material source. Such procedure shall be subject to the approval of the Engineer. Each layer of embankment shall be compacted by approved power drawn rollers to the density specified. All earth cuts, full width or part width cuts in side hill, which are not required to be excavated below subgrade elevation for base and backfilled, shall be scarified to a uniform depth of at least 6" below grade, and the material shall be mixed and reshaped by blading and than sprinkled and rolled in accordance with the requirement outlined above for earth embankments and to the same density as that required for the adjacent embankment.

3.2 RETAINING WALLS, STORM SEWERS, AND BRIDGES

A. Embankments or backfill placed adjacent to and over pipes, culverts, retaining walls, storm sewers and bridges shall be of suitable material and shall be placed in successive layers approximately parallel to the finished grade. Special care shall be taken to prevent any wedging action against the structure. For such distances along embankments adjacent to structures where it is impractical to employ the compaction methods above specified, the embankment material shall be placed in layers not exceeding 6" depth of loose material, thoroughly mixed and wetted uniformly to the moisture content directed, and shall be compacted by approved methods, maintaining the required moisture content by additional sprinkling, if necessary, until each layer has been uniformly compacted to the density specified. Embankments placed around spill-through type abutments shall be constructed in 6" loose layers of uniform suitable material placed in such manner as to maintain approximately the same elevation on each side of the abutment, and all materials shall be mixed, wetted and compacted as specified above.

3.3 DENSITY

A. For each layer of embankment, backfill and selected material, it is the intent of this specification to provide an apparent dry density of the minus 1/4 inch material of not less than **95 percent Standard Proctor Density** as prescribed by A.A.S.H.O. Standard Method T-99, latest revision. It is also the intent of this specification that the sequence of work in constructing embankments or backfill shall be such that no compacted layer will be allowed to lose either the moisture or density specified. In case work on any partially completed embankment or backfill is suspended, the top 6 inches shall be brought to the moisture and density specified for subgrade, before placing the next layer of embankment or backfill. After each layer of earth embankment or select material is completed, tests as necessary will be made. See Special Conditions. If the material fails to meet the density specified, it shall be reworked as necessary to obtain that density. The moisture content and density shall be maintained so as to pass the above compaction test until the base material is placed.

END OF SECTION 31 23 23

STORM WATER POLLUTION PREVENTION PLAN
SECTION 31 25 13

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work under the contract related to storm water pollution prevention. This specification is a performance specification as defined in in Section 00 70 00 General Conditions, Subsection “Supplemental General Conditions”, Art. SC-1 Definitions.

PART 2 - REQUIREMENTS

2.1 GENERAL

A. The intent of storm water management is to improve water quality by reducing the pollutants in storm water discharges from the site. Storm water means storm water runoff, surface runoff and drainage from the construction site. The Texas Commission on Environmental Quality (TCEQ) requires that construction activity including clearing, grading, and excavation that results in disturbance equal to or greater than one (1) acre and less than five (5) acres to meet the requirements of Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR 150000. The TPDES General Permit requirements include; development of a Storm Water Pollution Prevention Plan (SWP3), provision of a completed construction site notice, posting of a the completed copy of the construction site notice at the site, and provision of a signed copy of the construction site notice to the operator of any municipal separate storm sewer system. The Contractor must implement the Best Management Practices (BMP) for the construction activities as outlined in the Storm Water Pollution Prevention Plan (SWP3). Any person who violates the TPDES General Permit may be subject to fines and/or imprisonment. Attached to and a part of this specification are the following items:

a. Storm Water Pollution Prevention Plan (SWP3)

b. Construction Site Notice

2.2 STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. General:

A SWP3 has been prepared for this project and is included with this specification. The SWP3 identifies potential sources of pollution that may be expected to affect the quality of storm water discharges from the construction site and includes a site description, erosion and sediment controls, storm water management, other controls, maintenance procedures and inspection procedures to ensure compliance with the terms and conditions of the TPDES General Permit TXR 150000. The Contractor shall sign the Construction Site Notice, and retain a copy of it and the SWP3 on-site and implement, maintain and inspect the control techniques required by the SWP3.

B. Inspection and Maintenance:
Inspection and maintenance is required for all areas disturbed by construction activity and for all erosion and sediment controls that are used. Inspection shall be performed at least once a week, and within 24 hours of a storm event of 0.5 inches or greater for as long as a portion of the site is disturbed. The Contractor should select one individual who will be responsible for the inspection and maintenance of the system. The inspector will look at the control measures and determine if they are performing correctly and effectively. A report form is provided in the SWP3 for the inspector to use. Additional information and requirements are detailed in Section 1E20.3.5 - Maintenance/Inspection Procedures of the SWP3.

C. Certifications:
An Owner and Contractors Certification page is provided in the SWP3. The Contractor must identify and fill in any Sub-Contractors that are involved in implementation of the SWP3. All Contractors or Sub-Contractors identified must sign and date a copy of the certification statement. A copy of the certification statement can be found at the end of this section.

D. Storm Water Pollution Prevention Plan:
The SWP3, including the Construction Site Notice, are included on the following pages. After award of the project and execution of the Construction Site Notice, copies of these documents will be bound together in the executed contract documents. Two copies of the contract documents that contain the SWP3 will be provided to the Contractor and one copy must be kept at the site of the construction activities at all times.

2.3 CONSTRUCTION SITE NOTICE

A. A "Construction Site Notice for the TCEQ Storm Water Program TPDES General Permit TXR 150000" must be completed and retained on-site by the operator of the construction site. The operator is defined as follows:
   a) The person or persons that have operational control over the construction plans and specifications to the extent necessary to meet the requirements and conditions of this general permit (i.e. the Owner); or

   b) The person or persons that have day-to-day operational control of those activities at the construction site necessary to ensure compliance with the storm water pollution prevention plan for the site or other permit conditions, (i.e. the Contractor).

B. The Contractor will be required to complete and sign the Construction Site Notice after the project has been awarded and prior to beginning any construction activity. For signatory requirements refer to 30 TAC 305.44. A copy of the Owner's and Contractor's Construction Site Notice must be retained on-site at all times. If at any time the Contractor is changed then a new Construction Site Notice must be posted prior to when the new Contractor commences work at the site. The construction activities are authorized under the TPDES General Permit upon compliance with the conditions of Part II D.2 of the TPDES General Permit. A copy of the Construction Site Notice is included with this specification.

PART 3 - STORM WATER POLLUTION PREVENTION PLAN

3.1 Project Description

A. General

The project consists of installing 51,900 SF of concrete pavement, 14,100 SF building, miscellaneous site utilities and miscellaneous site grading and other related items of work. The installation will disturb approximately 2.04 acres.

B. Project Location

The project is located south side of Avenue A across from City Hall and east to the existing storage units in Port Aransas, Texas.

The project begins at:
Latitude ..... 27º 50' 09.6" N
Longitude ..... 97º 04' 06.3" W

The project ends at:
Latitude ..... 27º 50' 06.9" N
Longitude ..... 97º 04' 08.7" W

C. Owner: City of Port Aransas, Texas
D. Construction Contractor: _____
E. Name of Receiving Waters: Corpus Christi Bay
F. Site Map: The Storm Water Pollution Prevention Plan, site map can be found in the plans.

3.2 BEST MANAGEMENT PRACTICES (BMP)

A. Erosion Controls

The existing vegetation must be preserved to the greatest extent possible. The areas disturbed by construction will be seeded to provide stabilization and prevent erosion. The stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have ceased. Stabilization practices must be implemented no later than 14 days after the construction activities in any portion of the site have ceased. The above timing for stabilization practices does not apply to the following; areas where construction activity will resume in the area within 21 days, or in arid, semi arid or drought stricken areas. In these areas the stabilization measures will take place as soon as practicable. Other erosion control measures which may be implemented include:

- Temporary Vegetation
- Blankets/Matting
- Mulch
- Sod
- Interceptor Swale
- Diversion Dike
- Erosion Control Compost
- Mulch Filter Berms and Socks
- Compost Filter Berms and Socks

B. Sedimentation Controls

Sedimentation controls will be implemented to retain sediment onsite and minimize offsite transport to the extent practicable. Silt fence will be installed on the slopes to prevent sediment from entering the un-named tributaries of the Nueces River, the Frio River and the Choke Canyon reservoir during construction. Sediment must be removed no later than the time that the capacity of the control is reduced by 50%. If sediment escapes from the site the accumulations must be removed at a frequency so as to minimize further negative effects and whenever feasible prior to the next rain. Other sedimentation controls which may also be used include:

- Sand Bag Berm
- Rock Berm
- Brush Berms
- Mulch Filter Berms and Socks
- Compost Filter Berms and Socks
- Silt Fence
- Hay Bale Dike

- Triangular Filter Dike
- Stone Outlet Sediment Traps
- Sediment Basins
- Erosion Control Compost

C. Post-Construction TSS Control

A sod filter strip will be placed along the toe of slope of the disturbed areas in the vicinity of the un-named tributaries of the Nueces River, the Frio River, and Choke Canyon Reservoir to reduce the total suspended solids load in the storm water runoff. Other post-construction TSS control measures which may be implemented include:

- Retention/Irrigation
- Constructed Wetlands
- Extended Detention Basin
- Wet Basins
- Vegetative Filter Strips
- Vegetation Lined Drainage Ditches
- Grassy Swales
- Sand Filter Systems
- Erosion Control Compost
- Mulch Filter Berms and Socks
- Compost Filter Berms and Socks

3.3 OTHER CONTROLS

A. Waste Disposal

(1) Waste Materials:
All waste materials will be collected and stored in a securely lidded metal Dumpster rented from a reputable disposal company licensed for solid waste disposal. The Dumpster will meet all local, State and Federal solid waste management regulations. All trash and construction debris from the site will be disposed in the Dumpster. The Dumpster will be emptied as necessary and the trash hauled to a permitted waste disposal site. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedure for waste disposal. The Pollution Prevention Plan will be posted in the office trailer and the Construction Superintendent will be responsible for seeing that these procedures are followed.

(2) Hazardous Waste:
All hazardous waste materials will be disposed of in the manner as required by City, State or Federal regulations or by the materials manufacturer. All personnel will be instructed regarding the correct procedure for handling hazardous waste and the Construction Superintendent will be responsible for seeing that these procedures are followed.

(3) Sanitary Waste:
All sanitary waste will be collected from portable units as necessary and/or required by governing regulations. Collection will be by a licensed or permitted Disposal Company and the waste properly disposed of.

B. Offsite Vehicle Tracking
Stabilized construction entrances will be provided to help reduce vehicle tracking of sediments. The paved street adjacent to the site entrance will be swept daily to remove any excess mud, dirt or rock tracked from the site.

C. Sprinkling for Dust Control
The Contractor shall provide water as needed to sprinkle areas in order to control and minimize the generation of dust.

3.4 DEMONSTRATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

A. This plan follows the outline provided to meet the requirements of State regulations concerning storm water management.

3.5 MAINTENANCE/INSPECTION PROCEDURERS

A. General:

All erosion, sedimentation, post-construction TSS and other protective measures identified in the SWP3 must be maintained in effective operating condition. If during the regular inspections the permittee notes that the measures are not performing as intended then maintenance must be performed before the next storm event. Any measure that has been rendered ineffective due to construction activity must be replaced or corrected immediately.

B. Maintenance and Inspection Practices:
Erosion, Sedimentation and Post-Construction TSS Controls:
These are the maintenance and inspection practices that will be used to maintain erosion and sedimentation and post-construction TSS controls.

(1) Where possible, the site work will be performed in phases leaving certain areas undisturbed as the work progresses.
(2) All control measures will be inspected at least once each week and within 24 hours of any storm event of 0.5 inches or greater.
(3) All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
(4) Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
(5) Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
(6) Earthen dikes, sediment traps and check dams will be inspected to verify they are functioning as originally constructed.
(7) Temporary and permanent seeding, planting, mulching, sod stabilization and sod filter strips will be inspected for bare spots, washouts and healthy growth.
(8) A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is shown at the end of this section.
(9) The Construction Superintendent will select one individual who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance report.
(10) Personnel selected for inspection and maintenance responsibilities will receive training from the Construction Superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used on site in good working order.
(11) Inspection report with certification for compliance should be retained for at least three years.

3.6 INVENTORY FOR POLLUTION PREVENTION PLAN

A. The materials or substances listed below are expected to be present onsite during construction:
   a. Lumber
   b. PVC pipe
   c. Ductile iron Pipe Fittings
   d. Concrete materials and reinforcing steel
   e. Polyethylene pipe and products
   f. Petroleum and asphalt products
   g. Paint
   h. Fertilizer
   i. Herbicides

3.7 MANAGEMENT PRACTICE TO PREVENT SPILLS

A. General Material Management Practices:

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff. The following good housekeeping practices will be followed onsite during the construction project.

(1) An effort will be made to store only enough product required to do the job.
(2) All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
(3) Products will be kept in their original containers with the original manufacturer's label.
(4) Substances will not be mixed with one another unless recommended by the manufacturer.
(5) Whenever possible, all of a product will be used up before disposing of the container.
(6) Manufacturers' recommendations for proper use and disposal will be followed.
(7) The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

B. Hazardous Products Management Practices:

These practices are used to reduce the risks associated with hazardous materials.

(1) Products will be kept in original containers unless they are not resealable.
(2) Original labels and material safety data will be retained; they contain important product information.
(3) If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal would be followed.

C. Product Specific Practices:

The following product specific practices will be followed onsite.

(1) Petroleum Product:
All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

(2) Fertilizers:
Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

(3) Herbicides:
Herbicides used will be applied only in the minimum amounts recommended by the manufacturer. Applications shall be accomplished only at times when wind will not

cause over spray. Storage will be in a covered shed. Partially used containers of herbicides will be tightly resealed.

(4) Paints:
All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or State and local regulations.

(5) Concrete Trucks:
Concrete trucks will wash out or discharge surplus concrete or drum wash water only in specific areas selected and maintained by the Contractor. The Contractor will remove this waste material at the completion of the project.

3.8 SPILL PREVENTION AND CLEANUP

A. In addition to the management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

a. Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and location of the information and cleanup supplies.

b. Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

c. All spills will be cleaned up immediately after discovery.

d. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

e. Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.

f. The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

g. The Construction Superintendent responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator. He will designate at least one other site personnel who will receive spill prevention and cleanup training; this individual will become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

STORM WATER POLLUTION PREVENTION PLAN
INSPECTION AND MAINTENANCE REPORT

1) LOCATION OF BMP'S THAT NEED TO BE MAINTAINED:

_____

_____

_____

_____

2) LOCATION OF BMP'S THAT FAILED TO OPERATE AS DESIGNED:

_____

_____

_____

_____

3) LOCATIONS WHERE ADDITIONAL BMP'S ARE NEEDED:

_____

_____

_____

_____

4) CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN:

_____

_____

_____

_____

5) REASONS FOR CHANGES:_____

_____

_____

INSPECTORS SIGNATURE:_____ DATE:_____

OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

Date: _____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general Texas Pollutant Discharge Elimination System (TPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

SIGNATURE:	COMPANY	ACTIVITY RESPONSIBLE FOR:
Date:		
Date:		
Date:		
Date:		
Date:		
Date:		

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

STRUCTURAL CONTROLS

DATE: _____ INSPECTORS INITIALS: _____

SILT FENCE:

IS THE BOTTOM OF THE FABRIC STILL BURIED?	IS THE FABRIC TORN OR SAGGING?	ARE THE POSTS TIPPED OVER?	HOW DEEP IS THE SEDIMENT?

MAINTENANCE REQUIRED FOR SILT FENCE:

TO BE PERFORMED BY: _____ **ON OR BEFORE:** _____

Note: Inspections and reports to be performed at least once each week and following any storm event of ½ inch or greater.

LARGE CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Stormwater Program

TPDES GENERAL PERMIT TXR150000

"PRIMARY OPERATOR" NOTICE

This notice applies to construction sites operating under Part II.E.3. of the TPDES General Permit Number TXR150000 for discharges of stormwater runoff from construction sites equal to or greater than five acres, including the larger common plan of development. The information on this notice is required in Part III.D.2. of the general permit. Additional information regarding the TCEQ stormwater permit program may be found on the internet at:

https://www.tceq.texas.gov/permitting/stormwater/construction

Site-Specific TPDES Authorization Number:	
Operator Name:	
Contact Name and Phone Number:	
Project Description: *Physical address or description of the site's location, and estimated start date and projected end date, or date that disturbed soils will be stabilized.*	
Location of Stormwater Pollution Prevention Plan:	

LARGE CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Stormwater Program

TPDES GENERAL PERMIT TXR150000

"SECONDARY OPERATOR" NOTICE

This notice applies to secondary operators of construction sites operating under Part II.E.3. of the TPDES General Permit Number TXR150000 for discharges of stormwater runoff from construction sites equal to or greater than five acres, including the larger common plan of development. The information on this notice is required in Part III.D.2. of the general permit. Additional information regarding the TCEQ stormwater permit program may be found on the internet at:

https://www.tceq.texas.gov/permitting/stormwater/construction

Site-Specific TPDES Authorization Number:	
Operator Name:	
Contact Name and Phone Number:	
Project Description: *Physical address or description of the site's location, and estimated start date and projected end date, or date that disturbed soils will be stabilized.*	
Location of Stormwater Pollution Prevention Plan (SWP3):	

For Large Construction Activities Authorized Under Part II.E.3. (Obtaining Authorization to Discharge) the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.E.3. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A stormwater pollution prevention plan has been developed and will be implemented prior to construction, according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

Signature and Title_____ Date _____

_____ *Date Notice Removed*

_____ *MS4 operator notified per Part II.F.3.*

SECTION 31 31 16 - TERMITE CONTROL

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. Soil treatment with termiticide.

B. Related Sections:

1. Section 06 10 00 "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of termite control product.

1. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For termite control products, from manufacturer.

B. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.

2. Moisture content of soil before application.

3. Termiticide brand name and manufacturer.

4. Quantity of undiluted termiticide used.

5. Dilutions, methods, volumes used, and rates of application.

6. Areas of application.

7. Water source for application.

C. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

B. Source Limitations: Obtain termite control products from single source from single manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation, Agricultural Products; Termidor.
b. Bayer Environmental Science; Premise 75.
c. FMC Corporation, Agricultural Products Group; Dragnet FT.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

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

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

2. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

LABORATORY TESTING
SECTION 31 32 16

PART 1 - GENERAL

The following shall govern for testing on this project:

1.1 LABORATORY TESTING

A. All material to be used in subdivision construction shall be subject to testing if warranted. The preponderance of testing to be performed in subdivisions is directly related to street construction and a series of laboratory tests normally associated with road and street construction will be required in subdivisions, said being performed by an independent testing laboratory using qualified personnel. The testing laboratory will be selected by the Owner and the Owner will pay all testing fees for materials directly to said laboratory.

PART 2 – PRODUCT

2.0 RATIO OF TESTING

2.1 Densities

a. Pipe Trench Backfill.... ..... Not Required unless specifically requested
b. Existing Subgrade Density under concrete pavement…..1 per 5,000 SF (min 1 per pour)

2.2 Proctors (Moisture-Density Relationship):

a. Subgrade (RAW) ..... 1 per Project unless material changes
b. One Point Proctor ..... 1 per day

2.3 Concrete Cylinders:

a. Curb and Gutter ..... 1 Set (3) per 2 inlets/per 750’ of curb/per pour
b. Concrete Pavement ……..…… 1 Set (3) per pour Min. 1 every 500’ of street

2.4 Hydrostatic Testing of Water Systems: (See Subsection 33 05 05.31)

a. Laboratory Testing: None Required
b. Contractor Testing: (See Subsection 33 05 05.31)

2.5 Testing of Gravity Sanitary Sewer Lines: (See Subsection 33 05 05)

a. Laboratory Testing: None Required
b. Contractor Testing: (See Subsection 33 05 05)

2.6 Testing of Fiberglass Manholes: (See Subsection 33 05 76)

a. Laboratory Testing: None Required
b. Contractor Testing: (See Subsection 33 05 76)

2.7 Pressure Testing of Gas System: (See Port Aransas Gas Installation Specs and Subsection 2G26.5).

2.8 Retesting

A. The above schedule is a minimum schedule for testing, failures not included. In the event of failures, additional tests will be taken. If excessive rain occurs on a previously testing section, the City of Port Aransas shall have the right to order retests as necessary.

PART 3 – EXECUTION

3.1 TESTING PROCEDURE

A. The contractor shall coordinate with and notify the testing lab when tests are to be taken. The Contractor shall also coordinate with the City of Port Aransas to let them know testing is being scheduled. The contractor shall also contact the Engineer or his Representative and relay the testing is scheduled. Except as otherwise provided above, it is the intent of the City of Port Aransas that the Contractor not contact the lab for the purpose of requesting routine tests. The scope of testing of materials incorporated in the project construction is not necessarily limited to those tests outlined above. In the event of unusual conditions or other factors which may give the City of Port Aransas reason to question the quality of the materials in any portion of the project, the City of Port Aransas will have the right to order such additional tests as are necessary at the City of Port Aransas expense. However, the City of Port Aransas will consult with the Engineer on reasons for such additional tests before a testing lab will be asked to conduct such tests. All testing in accordance with these requirements will be performed in accordance with the American Society of Testing Materials (ASTM) latest revision, and/or as elsewhere provided in approved plans and specifications for the subdivision. The City of Port Aransas will require all test reports to be certified by a Registered Professional Engineer (Texas Registration) and will further require that the City of Port Aransas be furnished a minimum of two (2) copies of testing reports. Further, the Engineer shall provide the City of Port Aransas for the testing laboratory, a set of plans and specifications as well as a tabulation showing the estimate of quantities of material in the subdivision.

3.2 RETESTING

A. The cost of all retesting due to failures shall be borne by the Contractor by reimbursing the Owner or as a deduction from the final payment.

END OF SECTION 31 32 16

SECTION 31 63 29 – DRILLED PIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Slurry-method straight shaft drilled piers (with casings, if required).
B. Related Sections include the following:
   1. Division 3 – Section 03 30 00 "Cast-In-Place Concrete" for general structural and building applications of concrete.

1.3 BASIS OF BIDS

A. Base bids on indicated number of drilled piers; design length from top elevation to bottom of shaft, and diameter of shaft.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings Provide Electronic PDF's: For concrete reinforcement detailing fabricating, bending, and placing.
C. Design Mixes: For each class of concrete. Include revised mix proportions when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Laboratory Test Reports: For evaluation of concrete materials and mix design.
D. Welding certificates.
E. Qualification Data: For Drilled Pier Subcontractor and testing agency.
F. Record drawings at Project closeout according to Division 1 Section "Closeout Procedures."

1.5 QUALITY ASSURANCE

A. Drilled-Pier Standard: Comply with provisions in ACI 336.1, "Reference Specifications for the Construction of Drilled Piers," unless modified in this Section.
B. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
   1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.
C. Welding Standards: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
D. Trial Drilled Pier: Construct trial drilled pier of diameter and depth and at location indicated or, if not indicated, of same diameter and depth as drilled piers located at least three diameters clear of permanent drilled piers, to demonstrate Installer's construction methods, equipment, standards of workmanship, and tolerances.
   1. Excavate shaft, install reinforcement, fill with concrete, and terminate trial drilled pier 30 inches below subgrade and leave in place.
   2. Install and remove temporary casings, if required.
   3. If Architect or Geotechnical Engineer determine that trial drilled pier does not comply with requirements, excavate for and cast another until it is accepted.
E. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only. Drilled pier installation shall use casing and slurry to maintain proper pier excavation prior to reinforcement installation and concreting.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain. Cut bars true to length with ends square and free of burrs.

2.2 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

1. Fly Ash Admixture: ASTM C 618, Class C.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, 1-inch maximum aggregate size.

C. Water: Potable, complying with ASTM C 94/C 94M requirements.

D. Admixtures: Certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
3. High-Range, Water-Reducing Admixture: ASTM C 494, Type G.
4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Sand-Cement Grout: Portland cement, ASTM C 150, Type II; clean, natural sand, ASTM C 404; and water to result in grout with a minimum 28-day compressive strength of 1000 psi (6.9 MPa), of consistency required for application.

2.3 STEEL CASINGS

A. Steel Pipe Casings: ASTM A 283/A 283M, Grade C; or ASTM A 36/A 36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1.

2.4 CONCRETE MIX

A. Prepare design mixes according to ACI 211.1 and ACI 301 for each type and strength of concrete determined by either laboratory trial mix or field test data bases.

1. Use a qualified testing agency for preparing and reporting proposed mix designs for laboratory trial mix basis.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): **4,000 psi**
2. Minimum Slump: Capable of maintaining the following slump until completion of placement:
   a. 7 inches (+/- 1 inch).
3. Do not air entrain concrete for drilled piers.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.

D. Concrete-mix design adjustments may be considered if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant. Resubmit and obtain approval of proposed changes to concrete-mix proportions.

2.5 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. Do not add water to concrete mix after mixing.
2. Maintain concrete temperature to not exceed 90 deg F (32 deg C).

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavation is unclassified and includes excavation to bearing elevations regardless of character of materials or obstructions encountered.

1. Obstructions: Unclassified excavation includes removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions.
2. Obstructions: Removal of unanticipated boulders, concrete, masonry, or other unforeseen obstructions that cannot be removed by conventional augers fitted with soil or

rock teeth, drilling buckets of size, power, torque, and downthrust necessary for the Work, will be paid according to Contract provisions for changes in the Work.

B. Classified Excavation: Excavation is classified as standard excavation, special excavation, and obstruction removal and includes excavation to bearing elevations, as follows:
   1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth, drilling buckets of size, power, torque, and downthrust necessary for the Work.
   2. Special excavation includes excavation that requires special equipment or procedures above or below indicated depth of drilled piers where drilled-pier excavation equipment used in standard excavation, operating at maximum power, torque, and downthrust, cannot advance the shaft.
      a. Special excavation requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation.
      b. Earth seams, rock fragments, and voids included in rock excavation area will be considered rock for full volume of shaft from initial contact with rock.
   3. Obstructions: Removal of unanticipated boulders, concrete, masonry, or other unforeseen obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets of size, power, torque, and downthrust necessary for the Work, will be paid according to Contract provisions for changes in the Work.

C. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

D. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
   1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
   2. Remove water from excavated shafts before concreting.
   3. Excavate rock sockets of dimensions indicated.
   4. Cut series of grooves about perimeter of shaft to height from bottom of shaft, vertical spacing, and dimensions indicated.

E. Notify and allow Owner's testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
   1. Do not excavate shafts deeper than elevations indicated, unless approved by Architect.
   2. Additional authorized excavation will be paid according to Contract provisions for changes in the Work.

F. Excavate shafts for closely spaced drilled piers and those occurring in fragile or sand strata, only after adjacent drilled piers are filled with concrete and allowed to set.

G. Temporary Casings (if required): Provide watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
   1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.

H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
   1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

I. Inspection: Each drilled pier must be inspected and tested by Owner's testing and inspecting agency before placing concrete.
   1. Provide and maintain facilities with equipment required for testing and inspecting excavations. Cooperate with testing and inspecting personnel to expedite the Work.
   2. Notify Architect and testing agency at least 24 hours before excavations are ready for tests and inspections.

3.3 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.

D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover to reinforcement.

E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.

F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.

1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.

B. Slurry Method: Place concrete vertically through slurry to within 6” of bottom of excavation. Use tremie and pipe to direct concrete through slurry. Do not drop concrete through slurry.

C. Coordinate withdrawal of temporary casings (if required) with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.

1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.

D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.

E. Protect concrete work, according to ACI 301, from hot and cold temperatures that could cause physical damage or reduced strength.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.

F. When hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no greater than 90 deg F (32 deg C).

1. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit reports during excavation and concrete placement for drilled piers.

B. A drilled-pier report will be prepared by Owner's testing and inspecting agency for each drilled pier as follows:

1. Actual top and bottom elevations.
2. Top of rock elevation.
3. Description of soil materials.
4. Description, location, and dimensions of obstructions.
5. Final top centerline location and deviations from requirements.
6. Variation of shaft from plumb.
7. Shaft excavating method.
8. Design and tested bearing capacity of bottom.
9. Depth of rock socket.
10. Levelness of bottom and adequacy of cleanout.
11. Ground-water conditions and water-infiltration rate, depth, and pumping.
12. Description, diameter, top & bottom elevations of temporary or permanent casings.
13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
14. Shaft dimensions and variations from original design.
15. Date and time of starting and completing excavation.
16. Inspection report.
17. Position of reinforcing steel.
18. Concrete placing method, including elevation of consolidation and delays.

19. Elevation of concrete during removal of casings (if required).
20. Locations of construction joints.
21. Remarks, unusual conditions encountered, and deviations from requirements.
22. Concrete testing results.

C. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities will be determined by Owner's testing and inspecting agency. Final evaluations and approval of data will be determined by Architect.
1. Bearing Stratum Tests: Owner's testing agency will take undisturbed core samples from drilled-pier bottoms; test each sample for compression, moisture content, and density; and report results and evaluations.

D. Concrete: Sampling and testing of concrete for quality control may include the following:
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94/C 94M.
a. Slump: ASTM C 143/C 143M; one test at point of placement for each compressive-strength test, but no fewer than one test for each concrete load.
b. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
c. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens, unless field-cured test specimens are required.
d. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier, but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and one specimen will be retained in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
5. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests will contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, concrete type and class, location of concrete batch in drilled pier, design compressive strength at 28 days, concrete-mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
6. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as sole basis for acceptance or rejection.
7. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate concrete strengths or other requirements have not been met.
a. Continuous coring of drilled piers may be required, at Contractor's expense, when temporary casings (if required) have not been withdrawn within specified time limits or where observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.

3.6 DISPOSAL OF MATERIALS

A. Remove surplus excavated material and concrete and legally dispose of it off Owner's property.

END OF SECTION 31 63 29

LANDSCAPE MAINTENANCE - SECTION 32 01 90

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent: Furnish all labor, material, equipment, tools, and incidentals necessary for Landscape Maintenance as specified in this Section during the landscape maintenance period, referred to herein as the Maintenance Period. The work includes establishing the plantings, providing pest and disease control, mowing, and maintaining the irrigation system and related construction elements during the Maintenance Period.

B. Related Work:
   1. Landscape Irrigation
   2. Landscape Planting

1.03 MAINTENANCE PERIOD

A. Time Limits: Maintenance Period shall commence from the date of approval of substantial completion and extend for 60 calendar days, or until final completion approval, whichever is later.

1.04 REVIEWS

A. Substantial Completion Review: Contractor shall specifically request this review at least (5) five days in advance of the proposed start of the Maintenance Period. The Architect will review for a final checklist of minor items to be completed. Once the items are completed by the Contractor and approved by the Architect, the Maintenance Period shall commence. Items to be checked during this review include but are not limited to:
   1. All planted areas including turf and seeded areas if applicable.
   2. Valve box inspection and overall operation of the irrigation system.

B. Punch-list Check: The Architect shall conduct this review within two weeks of the end of the Maintenance Period, at the request of the Architect, when punch-list items identified at Substantial Completion have been corrected and are ready for inspection. The Final Review shall be rescheduled at the discretion of the Architect, if additional time beyond the scheduled date of final completion is needed to correct Punch-list items.

C. Final Review: Contractor shall specifically request this review at least (5) five days in advance of the end of the Maintenance Period. Failure to request this notice shall automatically extend the date of completion. The Maintenance Period will continue until final completion is approved by the Architect. Items to be checked during this review include but are not limited to:
   1. All planted areas including turf and seeded areas if applicable, including all punch-list items identified at Substantial Completion Review and Punch-list Check.
   2. All irrigation punch-list items identified at Substantial Completion Review, and Punch-list Check.

1.05 MAINTENANCE PERIOD SUBMITTALS

A. Fertilizer: Submit written certificate showing rates, materials, and date of fertilizer application, to the Architect within five (5) days of each application.

B. Pesticides / herbicides: If pesticides / herbicides are used, submit written certificate showing rates, materials, and date to the Architect within five (5) days of each application.

C. Mowing: Submit mowing occurrences to the Architect each time mowings are completed.

1.06 MAINTENANCE BINDER ADDITIONAL DOCUMENTS

A. Submit prior to the Final Review, the following additional documents for the Maintenance Binder.
   1. Counter-signed documents shall include the following items, countersigned by the Architect:
      a. Fertilizer applications, including initial application.
      b. Pesticide and herbicide applications, including initial application.
      c. Mowing occurrences
      d. In-service meeting discussion / decisions.
      e. As-Built Irrigation Plan

B. Controller Schedule: 8.5x11 size type-written and laminated irrigation schedule for established (mature) landscape at end of Maintenance Period for reference purposes inside the controller. Schedule shall note run-times and frequency for each station.
   1. Attach irrigation schedule to laminated valve stationing plan – see Specification Section Landscape Irrigation.

C. The Final Review shall not take place until the additional submittals and documents have been reviewed and approved by the Architect.

PART 2 - MATERIALS

2.01 FERTILIZER

A. For maintenance fertilization shall be as specified in Specification Section Landscape Planting.

2.02 WATER

A. During the course of construction and maintenance, water for landscape shall be paid for by the Owner. Submit watering schedule with dates, times and frequency at start of the Maintenance Period.

2.03 PRE-AND/OR POST-EMERGENT HERBICIDE

A. As recommended by licensed Pest Control Operator and approved by Owner / Architect.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor's Responsibility: Work installed under this Contract damaged by vandalism, vehicular damage and/or theft during the installation of the work and up to the Substantial Completion approval, shall be repaired or replaced by the Contractor without costs to the Owner.

B. Owner's Responsibility: Throughout the Maintenance Period, these damages and similar factors such as excessive litter, abuse and defacement shall be the Owner's responsibility to repair or replace and shall not be a part of this Contract.

3.02 BASIC REQUIREMENTS

A. All planting areas shall be kept weed-free at all times during the Maintenance Period. All pests and disease control shall be the Contractor's responsibility. All planting areas shall be kept at optimum moisture for plant growth. Planting not adequately served by the automatic irrigation

system shall be hand watered. Settlement of soil and plants and soil erosion shall be repaired and areas replanted. Dying or deficient plants shall be replaced as they become apparent.

B. Weeding, Cultivating, and Clean-Up: Planting areas shall be kept neat and free from debris at all times and shall be cultivated and weeded at not more than ten (10) day intervals.

C. Fertilizer: Application for all planting areas including turf shall be as specified in Specification Section Landscape Planting. Excludes naturalized areas only.

D. Mowing Schedule:
   1. Winter - Mow grass to 3/4" when it reaches a height of 1-1/2".
   2. Other Seasons - Mow grass to 1” when it reaches a height of 2”.

E. Pruning: Prune new trees and shrubs with the direction of the Architect. Do not remove lower branches from multi-trunk or low branching trees unless directed.

F. Insect, Pest, and Disease Control: Insects, pests, rodents and diseases shall be controlled by the use of approved insecticides and fungicides, as recommended and applied by a licensed pest control operator and as approved by the Architect.

G. Replacement Materials: Immediately replace any dead or damaged plant materials. Turf areas not fully established and healthy shall be repaired or replaced as directed by the Architect. Replacements shall be made to the specifications as required to match adjacent plantings at no cost to the Owner.

H. Irrigation: Schedule and monitor controller stations as necessary to minimize water consumption while still providing adequate water for the plant material.
   1. Adjust and clean all heads, arcs and radii, valves, and other equipment as necessary including drip system, filters, and emitters to maintain the system.

3.03 CONDITION OF PLANTING AT END OF MAINTENANCE PERIOD

A. All mulched planting areas shall be free of all weeds (broadleaf and grass weeds). Plantings that do not conform to specifications shall be replaced and brought to a satisfactory condition before final acceptance of the work.

B. All turf areas shall be completely covered at the time of final acceptance. Turf areas shall be free of all weeds (broadleaf and grass weeds) and shall be mowed to specified height. Low spots and/or bare patches shall be patched with sod.

C. Remove all nursery tree stakes and associated tying materials prior to Final Review.

D. Rake out watering basins from all plants under a permanent irrigation system and re-spread the mulch prior to Final Review, keeping mulch away from the plant stem.

3.04 IN-SERVICE MEETING

A. Contractor shall request, prior to Final Review, an in-service meeting with the Owner’s maintenance staff to identify any landscape maintenance issues and verify mowing schedules, and irrigation station sequence / run-times (controller schedule).
   1. The Contractor shall document any discussions / decisions at the in-service meeting and provide this to the Architect. Include a copy in the Maintenance Binder.
   2. The Final Review shall not take place until the in-service meeting is completed, and final approval is contingent on the in-service meeting taking place to the satisfaction of the Architect.

3.05 HARDWARE

A. Contractor shall provide the Owner at the in-service meeting (2) sets of each of the following:
   1. Quick Couplers - quick coupler keys
   2. Irrigation Controller – enclosure keys
   3. Special tools required for the maintenance of specific components
   4. Other enclosures / back flow preventers – enclosure / lock keys
   5. Hose bibb keys.

END OF SECTION

PORTLAND CEMENT CONCRETE PAVEMENT
SECTION 32 11 33.13

Part 1 - GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to construct the Portland cement concrete pavement required to complete the project.

Part 2 – PRODUCTS

2.1 CONCRETE

A. Concrete shall be specified in Subsection 03 30 02 "Normal Weight Aggregate Concrete", Class A (3000 PSI @ 28 days), with the following exceptions. The slump range shall be maintained between 1" and 3". Air entrainment shall be 5% by volume and be maintained between 6% max. and 4% minimum.

2.2 REINFORCING STEEL AND DOWEL BARS

A. Reinforcing steel shall be as specified in Section 03 20 01 "Concrete Reinforcement".

2.3 LOAD TRANSISSION DEVICES

A. Smooth steel bar dowels, ASTM A615, Grade 40. The free end of the dowel bars shall be free of shearing burrs. The free end of each dowel bar shall be encased in an approved cap having an inside diameter of 1/16 inch greater than the diameter of the bar. The end of the cap shall be void to permit free movement of the bar for a distance of 150 percent of the width of the expansion joint used.

2.4 EXPANSION JOINT MATERIAL

A. Expansion joint material shall be 3/4 inch thick fiberboard or asphalt impregnated preformed filler conforming to the requirements of AASHTO M33 or M213; ASTM D994 or D1751 as specified, and shall be punched to admit dowels where called for in the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise authorized by the engineer. When the use of more than one piece is authorized for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening satisfactory to the engineer.

2.5 EXPANSION JOINT SEALING MATERIAL (New Concrete to New Concrete)

A. Expansion joint seal shall be a continuous flexible, modified PVC cap seal, G-Seal #605 as manufactured by Greenstreak or equivalent. Cap seal is attached to the top of the expansion board.

2.6 EXPANSION JOINT SEALING MATERIAL (New Concrete to Existing Concrete)

A. Where new concrete is poured against existing concrete, expansion joint material shall be mounted against existing and this joint sealed with polyurethane joint sealant. Joint sealant shall be Bostik 950, or approved equal, polyurethane joint sealant and shall meet the requirements of

ASTM C920-87, Type S or M, Grade P, Class 25 Uses T, M. A and O. Where grade is greater than a 3% slope, use Bostik 900 sealant.

2.7 CONTRACTION JOINT SEALING MATERIAL

A. Contraction joint sealant shall be Bostik 950, or approved equal, polyurethane joint sealant and shall meet the requirements of ASTM C920-87, Type S or M, Grade P, Class 25 Uses T, M. A and O. Where grade is greater than a 3% slope, use Bostik 900 sealant.

2.8 EQUIPMENT

A. Equipment shall conform to Item 360.4 "Equipment", of the Standard Specification for Construction of Highways, Streets and Bridges, 1993 Edition; of the Texas Department of Transportation.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation and Subgrade Preparation shall be as specified on the drawings, and Section 31 20 00. The bottom of the excavation or top of the fill shall be known as the pavement subgrade and shall conform to the line, grade, and cross sections shown in the plans. All soft and yielding material and portions of the subgrade that will not compact readily when rolled or tamped shall be removed and replaced with suitable material. The subgrade shall be brought to a firm and unyielding condition by compacting it to density as specified at or slightly above standard optimum moisture. All utility trenches and structure excavations shall be backfilled to natural or finished grade with soils like those surrounding the trench as soon as conditions permit. All backfill shall be compacted with mechanical tampers in layers of not over 6 inches in compacted thickness. Concrete shall not be placed on a soft, spongy, frozen or otherwise unsuitable subgrade. The subgrade shall be moist when the concrete is placed. Before placing concrete, the subgrade shall be tested for conformity with the plan section which requires compaction to 95% STD, Proctor Density. If necessary, material shall be removed per Texas Highway Department Specification (1982) Item 360.5. If additional material is to be added, the subgrade shall be scarified, reshaped, recompacted and tested again to ensure that optimum moisture and density are obtained. The surface of the subgrade shall be kept wet at all times after testing and before placement of the concrete paving.

3.2 FORMS

A. Form work shall be as specified in Section 03 10 01 "Concrete Formwork". The following additional data shall apply to concrete street construction.
   a. General:
      Forms shall be of such cross section and strength and so secured as to resist the pressure of the concrete when placed and the impact and vibration of any equipment they support, without springing or settlement. The method of connection between sections shall be such that the joints shall not move in any direction. The maximum deviation of the top surface shall not exceed 1/8 inch in 10 ft. or the inside face not more than 1/4 inch in 10 ft. from a straight line. Flexible or curved forms of proper radius shall be used for curves of 100 ft. radius or less.
   b. Setting Forms:
      The subgrade under the forms shall be compacted and cut to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. All forms shall be cleaned and oiled each time they are used.

c. Grade and Alignment:
The Contractor shall check and correct alignment and grade elevations of the forms immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

d. Curbs and Gutters as Forms:
In lieu of setting forms, the edge of a previously placed concrete gutter section may be used as a form.

3.3 REINFORCING STEEL

A. Reinforcing Steel, load transfer devices, longitudinal joint dowels, and curb reinforcement shall be located and accomplished in accordance with the drawings. When not shown on the drawings, provide expansion joint at changes of direction and at a maximum 40 feet spacing. Concrete reinforcement shall be further specified in Section 03 20 01 "Concrete Reinforcement".

3.4 CONCRETE MIXING AND PLACING

A. Concrete mixing shall be specified in Subsection 03 30 02 "Normal Weight Aggregate Concrete". Concrete placement shall be governed by Texas Highway Department of Transportation Specification (1993) Item 360.8 - Construction Joints.

3.5 SPREADING AND FINISHING

A. Texas Highway Department of Transportation Specification (1993) Item 360.10 shall govern.

3.6 JOINTS

A. General:
Contraction joints, expansion joints, and all longitudinal joints shall be placed as indicated in the plans. Transverse joints shall extend continuously through the pavement and curb.

B. Transverse Contraction Joints:
Transverse contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. They shall be equal to at least 1/4 the depth of the slab.

(1) Transverse slip contraction joints shall be formed by installing a parting strip to be left in place.

(2) Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place until the concrete has attained its initial set and shall then be removed without disturbing adjacent concrete.

(3) Sawed contraction joints shall be created by sawing grooves in the surface of the pavement with an approved concrete saw. After each joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly cleaned. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 16 hours. All joints shall be sawed before uncontrolled shrinkage cracking occurs, but in no case in excess of 16 hours. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. A standby saw shall be available in the event of breakdown. The sawing of any joint shall be omitted if a crack occurs at or near the joint location before the time of sawing. Sawing shall be discontinued if a crack develops ahead of the saw. In general, all joints shall be sawed in sequence. All contraction joints in lanes adjacent to previously constructed lanes shall be sawed before uncontrolled cracking occurs. If extreme conditions make it impracticable to prevent erratic cracking by early sawing, the contraction joint groove shall be formed before initial set of concrete as provided above.

(4) Transverse formed contraction joints shall consist of a groove or cleft extending downward from and normal to the surface of the pavement. These joints shall be made while the concrete is plastic by an approved mechanically or manually operated device to the dimensions indicated by the plans.

C. Transverse Construction Joints:

Transverse construction joints shall be placed whenever the placing of concrete is suspended for more than 30 minutes. A butt joint with dowels or a thickened edge joint shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tiebars shall be used if the joint occurs at any other location.

D. Transverse Expansion Joints:

Transverse expansion joints shall consist of a vertical expansion joint filler placed in a butt-type joint with or without dowel bars as shown in the plans. The expansion joint filler shall be continuous from form to form. Preformed joint filler shall be furnished in lengths equal to the pavement width or equal to the width of one lane. Damaged or repaired joint filler shall not be used unless approved by the engineer. The expansion joint filler shall be held in a vertical position. An approved installing bar or other device shall be used if necessary to ensure proper grade and alignment during placing and finishing of the concrete. Finished joints shall not deviate in horizontal alignment more than 1/4 inch from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

E. Longitudinal Joints:

Longitudinal joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. They shall be equal to at least one-quarter the depth of the slab plus 1/2 inch.

(1) Sawed longitudinal joints shall be created by sawing grooves in the surface of the pavement with an approved concrete saw. After each joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly cleaned. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 16 hours. All joints shall be sawed before uncontrolled shrinkage cracking occurs, but in no case in excess of 16 hours. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

(2) Longitudinal groove joints are formed in the same manner as transverse formed groove joints (Subparagraph d of these specifications)

(3) Longitudinal strip joints are formed in the same manner as transverse strip joints (Subparagraph "B" of these specifications).

(4) Longitudinal construction joints shall be of the dimensions shown in the plans. Where a key is required, it shall be constructed by forming when the first lane adjacent to the joint is placed. These joints shall be finished with an edger of the radius shown in the plans. When placing the second slab, concrete must not be left overhanging the lip formed in the first slab by the edging tool.

F. Sealing Joints:

Joints to be sealed shall be filled with joint-sealing material before the pavement is opened to traffic and as soon after completion of the curing period as is feasible. Just before sealing, each joint shall be thoroughly cleaned of all foreign material, including membrane curing compound, and joint faces shall be clean and surface-dry when seal is applied. Material for seal applied hot shall be stirred during heating to prevent localized over- heating. The sealing material shall be applied to each joint opening in accordance with the details shown in the plans or as directed by the engineer. The joint filling shall be done without spilling material on the exposed surfaces of the concrete. Any excess material on the surface of the concrete pavement shall be removed immediately and the pavement surface cleaned. The use of sand or similar material to cover the seal shall not be permitted. Joint sealing material shall not be placed when the air temperature in the shade is less than 50 deg. F., unless approved by the engineer.

3.7 CURING

A. Texas Highway Department of Transportation Specification (1993) Item 360.11 shall govern.

3.8 REMOVING FORMS

A. Forms shall be carefully removed so that the pavement and/ or concrete is not damaged. All honey combed areas shall be pointed up with approved mortar. Forms shall remain in place a minimum of 8 hours after the concrete has been placed.

3.9 DETERMINATION OF ACCEPTABLE PAVEMENT THICKNESS

A. To determine that the finished pavement is in conformity with the thickness and typical sections shown on the drawings or specified herein, the pavement will be core drilled; one core shall be taken for each 2500 square yards of pavement. Drill sites shall be chosen that will well represent each particular 2500 square yard unit. When the measurement of the core from any unit is not deficient more than 1/2 inch from the plan thickness, full payment will be made. When the measurement of the core is deficient more than 1/2 inch, two additional cores shall be drilled. If the average pavement thickness deficiency of the three cores is determined to be greater than 1/2 inch from the plan thickness, the engineer shall evaluate the deficiency and if, in the judgment of the Engineer an area should be removed and replaced, it shall be done at the Contractor's entire expense. The Contractor shall grout closed all core drill holes immediately upon completion of the test.

3.10 PROTECTION OF PAVEMENT AND OPENING TO TRAFFIC

A. Protection of Pavement:
Barricades shall be placed so as to prohibit all traffic on newly placed pavement for a minimum of 14 days or as specified below.

3.11 OPENING TO TRAFFIC

A. The engineer shall decide when the pavement shall be opened to traffic. It shall not be opened to traffic until the field-cured concrete has attained a flexural strength of 500 P.S.I., or a compressive strength of 3,000 PSI. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after concrete placement. Before opening to construction traffic, the pavement shall be cleaned, backfill shall be placed and compacted behind curbs and against the edge of pavement, and joints shall be sealed.

END OF SECTION 32 11 33.13

CONCRETE CURB, GUTTER, AND CONCRETE VALLEY GUTTER
SECTION 32 16 13.13

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to provide the concrete curb and gutter and/or concrete valley gutter required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 REINFORCING STEEL AND DOWEL BARS

Billet steel, ASTM A615 Grade 60. When not shown on the drawings, provide:

a. Reinforcing Steel 3 - No. 4 bars (deformed bars).

b. Dowels 2 - No 5. bars (smooth bars).

A. Concrete:

Concrete shall be specified in Subsection 3C4 "Concrete Structures" and Subsection 03 30 02 "Normal Weight Aggregate Concrete," Class A - 3000 PSI @ 28 days.

B. Expansion Joint Material:
Expansion joint material shall be 3/4" wood fiber asphalt - impregnated expansion board.

C. Paving Cap Seal:
Paving cap seal shall be Greenstreak #610 or approved equal stapled or nailed to expansion board.

D. Curing Compound: Resin Base ASTM C309 Type 1, with light red tint of fugitive dye.

E. Mortar Topping:

a. Cement: ASTM C-150, Type I.
b. Water: ASTM C-94. Potable water need not be tested.
c. Sand: ASTM C-33
d. Mix: 1 part cement and 2 parts sand

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation, preparation of subgrade and backfill shall be in conformance with the section of these specifications entitled "Street Excavation and Backfill", Subsection 31 20 00.

3.2 SUBGRADE

A. The subgrade under the curb and gutter shall be lime stabilized and compacted to the density shown on the drawings. When a density is not shown on the drawings, compaction shall be **95% Standard Proctor Density** (ASTM D698).

3.3 FORMS

A. The forms shall be straight, durable and have a depth equal to the required concrete depth. The forms shall be securely staked to line and grade in such a manner that there shall be no movement when the concrete is placed. The subgrade shall be free of loose material and wet down before placing concrete. Concrete shall not be placed until forms have been approved by the Engineer.

3.4 REINFORCING STEEL

A. Reinforcing steel, expansion joints with dowels and transverse marking shall be located and accomplished in accordance with the drawings.

3.5 CONCRETE PLACEMENT

A. The concrete shall be placed in such a manner so that segregation does not occur. The concrete shall be thoroughly tamped with a "jitter- bug" or other approved tool.

3.6 SHAPING

A. The curb and gutter shall be shaped using a "mule" approved by the Engineer.

3.7 MORTAR TOPPING

A. The mortar topping shall be placed no longer than one hour after the initial set of the concrete. The mortar topping shall be smoothed with an approved "mule", all joints and edges shall be tooled, then the topping shall be lightly broomed with a hair broom.

3.8 CURING

A. Immediately after the brooming has been completed, curing compound shall be evenly applied. The quantity applied shall be as directed by the Engineer.

3.9 REMOVAL OF FORMS

A. Back forms and lip forms shall be left in place for at least 24 hours. All honey comb shall be plastered before backfilling is accomplished.

3.10 BACKFILLING

A. The concrete curb and gutter shall be carefully backfilled with material taken from the excavation. Backfill shall be placed and completed against the back of the curb and gutter before placing material for pavement section (concrete or caliche) between curbs and gutters. All excess material shall be hauled off the site by the Contactor. The area adjacent to the curb and gutter shall be uniformly graded so as to provide positive drainage towards the street.

B.

END OF SECTION 32 16 13.13

CONCRETE SIDEWALK AND CONCRETE DRIVEWAYS
SECTION 32 16 23

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to provide the concrete sidewalk and/or concrete driveways required to complete the project. This specification is a Performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 STEEL REINFORCING AND DOWEL BARS

A. Billet Steel, ASTM A615 Grade 60.

a. Steel reinforcing:
Provide 4" x 4" - W2.9 x W2.9 welded wire fabric or as shown on drawings.

b. Dowels:
Provide 1/2" diameter smooth bars as follows:

Width of Walk	No. of Dowels per Joint	Width of Drive	No. of Dowels per Joint
2 ft.	2	8 ft.	6
3 ft.	2	10 ft.	7
4 ft.	3	12 ft.	8
5 ft.	4	16 ft.	11
6 ft.	5	18 ft.	12
		20 ft.	13
		24 ft.	16

2.2 CONCRETE

A. Concrete shall be Class A, 3000 PSI @ 28 days as specified in Subsection 03 30 02 "Normal Weight Aggregate Concrete".

2.3 EXPANSION JOINT MATERIAL

A. Expansion joint material shall be 3/4" wood fiber asphalt - impregnated expansion board.

2.4 PAVING CAP SEAL

A. Paving cap seal shall be Greenstreak #610 or approved equal stapled or nailed to expansion board.

2.5 CURING COMPOUND

A. Resin base ASTM C309 Type I, with light red tint of fugitive dye.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation shall include all classes of material, including old concrete.

3.2 SUBGRADE

A. Subgrade under the sidewalk and/or driveway shall be thoroughly compacted and shall be true to line and grade. The subgrade shall be free from soft spots and loose material. Compaction under concrete driveways shall be **95%** Standard Proctor Density (ASTM D-698) unless shown otherwise on the drawings.

3.3 FORMS

A. Forms shall be straight, durable and have a depth equal to the required concrete depth (Commercial size lumber may be used provided full depth of concrete is obtained). The forms shall be securely staked to line and grade in such a manner that there shall be no movement when the concrete is placed. The subgrade shall be wet down before placing concrete. The forms shall be cleaned and oiled before placing concrete. Concrete shall not be placed until forms have been approved by the Engineer.

3.4 REINFORCING STEEL

A. Wire mesh shall be supported to insure that it is covered with a minimum of 1-1/2” of concrete.

3.5 EXPANSION JOINTS AND TRANSVERSE MARKINGS

A. Expansion joints and transverse markings shall be square with the sidewalk and/or concrete driveway. Expansion joints with dowels and transverse marking shall be located and accomplished in accordance with the drawings. When not shown on the drawings, provide doweled expansion joints at changes of direction and at maximum 40 feet spacing and provide transverse markings (1/8 inch wide and 1/2 inch minimum depth) at maximum 10 feet spacing.

3.6 CONCRETE PLACEMENT

A. The concrete shall be placed in such a manner so that segregation does not occur. The concrete shall be thoroughly tamped with a "jitterbug" or other approved tool.

3.7 JOINTING AND TOOLING

A. All joints and edges shall be tooled and the finished surface shall be lightly broomed (with a hair broom) to provide a non-skid surface. When directed by the Engineer, the Contractor shall apply an approved sand-cement mixture to the surface just before the final floating and troweling.

3.8 CURING

A. Immediately after the brooming has been completed, curing compound shall be evenly applied. The quantity applied shall be as directed by the Engineer.

3.9 REMOVING FORMS

A. Forms shall be carefully removed so that the sidewalk and/or concrete driveway is not damaged. All "honey comb" shall be plastered before backfilling is accomplished.

3.10 JOINING NEW AND OLD CONCRETE

A. When joining new and old concrete, the old concrete shall be cut with a concrete saw for a depth of 1/2", then the remaining depth shall be neatly broke using an approved method, then the exposed edges shall be thoroughly cleaned and then painted with an epoxy bonding agent before placing the new concrete. The epoxy bonding agent shall be applied in strict conformance with manufacturer's recommendations. When expansion joints are provided utilize 3/4" wood fiber expansion board and Greenstreak #628 paving cap seal at interface with existing and new concrete.

3.11 BACKFILLING

A. The concrete sidewalk and/or driveway shall be carefully backfilled with material taken from the excavation. The Contractor shall neatly spread all excess material as directed by the Engineer. The area adjacent to the sidewalk and/or driveway shall be uniformly graded to provide positive drainage towards the street.

END OF SECTION 32 16 23

CHAIN-LINK FENCE
(HEAVY-DUTY)
SECTION 32 31 13

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary for providing and installing the 8' chain-link fence (7’ high fabric and 3 strands of barbed wire), gates and signage required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 GENERAL

A. All materials used for fencing shall be new and shall be First Class. The use of re-rolled, open seam tubing, or any used material will not be allowed. Posts, gate frames, braces, rails, stretcher bars, and truss rods shall be of steel; reinforcing wires shall be of high carbon steel; and gate hinges, post caps, stretcher bar bands, and other parts shall be of steel, malleable iron, ductile iron or equal except that ties and clips may be of aluminum.

2.2 POSTS, GATE FRAMES, RAILS, AND BRACES

Posts, gate frames, rails, and braces shall conform to the dimensions and weights shown in the following table.

Use	**Section**	**Outside Diameter or Dimensions, Nominal** (Inches)	**Weight Per Foot** (Pounds)
End, corner, and pull posts (tubular):			
	Round	2.875	5.79
	Square	2.50	5.70
Gate posts for nominal width of gate, single, or one leaf of double			
6 feet and less:	Round	2.875	5.79
	Square	2.50	5.70
Gate width 13 feet and less:	Round	4.00	9.10
	Square	3.00	9.10
Gate width over 13 feet to			
18 feet, incl.:	Round	6.625	18.97
Gate width over 18 feet:	Round	8.625	24.70
Gates: exterior frames:	Round	1.90	2.72
	Square	1.50	2.10
Internal gate bracing:	Round	1.66	1.806
	Square	2.00	1.90
Rails and post braces (tubular):	Round	1.660	1.806
Intermediate posts:			
	Tubular, Round	2.375	3.65
	H-Section	2.25 x1.95 x 1.43	4.10

All steel and iron parts shall be zinc-coated after fabrication, using zinc grade "E" in accordance with Federal Specification QQ-Z-351. The weight of the zinc coating per square foot of actual surface area shall average not less than 1.2 ounces and no individual specimen shall show less than 1.0 ounces.

2.3 BARBED WIRE

A. Barbed wire shall consist of 3 strands of 12-1/2-gauge wire with 14 gauge 4-point barbs spaced approximately 5 inches apart. All wire shall be zinc coated with a minimum coating of .80 ounces per square foot of surface area on 12-1/2 gauge wire and .60 ounces per square foot of surface area on 14-gauge wire.

2.4 FABRIC

A. Definitions:
   (1) Chain link fence fabric:
   Chain link fence fabric is a fencing material made from wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or of twisting and barbing the ends of the wires to form the selvage of the fabric.
   (2) Knuckling:
   Knuckling is the term used to describe the type of selvage obtained by interlocking adjacent pairs of wire ends and binding the wire ends back into a closed loop.

B. Base Metal:
The base metal of the fabric shall be a good commercial quality of steel wire. The wire shall with stand a breaking load of 1,290 lbs.

C. Zinc-coating:
The fabric shall be zinc-coated by the hot-dip process after fabrication, or shall be fabricated from wire zinc coating by the electrolytic or hot dip process. The weight of zinc coating shall be not less than 1.2 ounces per square foot of actual surface covered. The zinc used for the coating shall conform to the grades specified in ASTM Designation B6 Standard Specifications for Slab Zinc.

D. Fabric Sizes:
   (1) General:
   The height, size of mesh, and wire diameters of chain link fence shall be 84-inch high by 2-inch mesh by 0.1483-inch diameter (No. 9 gauge).
   (2) Height of fabric:
   The height of fabric shall be the overall dimension from ends of barbs or knuckles. The tolerance on the nominal height shall be plus or minus one inch.
   (3) Mesh sizes:
   The size of mesh shall be determined by measuring the minimum clear distance between the wires forming the parallel sides of the mesh, measured in either direction. The tolerance in the size of 1-3/4 and 2-inch mesh shall be plus or minus 1/8 inch; for 1-inch mesh, plus of minus 1/16-inch.
   (4) Wire diameter:
   The diameter of the coated wire shall be determined, as the average of two readings measured to the nearest 0.001-inch taken at right angles to each other on the straight portion of the parallel sides of the mesh. The tolerance in the diameter of the coated wire shall be plus or minus 0.005-inch.

E. Selvage:
Fabric shall be furnished with twisting and barbing on both selvages.

F. Workmanship:
The chain link fence fabric shall be made of high-grade materials and with good workmanship. The zinc coating shall be applied in a continuous process and shall not be applied to the fabric in roll form. Excessive roughness, blisters, salammoniac spots, bruises and flaking shall be noted.

These and other obvious defects, if present to any considerable extent, may provide a basis for rejection.

2.5 CONCRETE

A. Concrete shall have a minimum compressive strength of 2000 p.s.i. at 28 days and shall be in accordance with Subsection 03 30 02 - "Normal Weight Aggregate Concrete".

2.6 FEATURES

A. Gates:
Gates shall be swing type complete with latches, stops, keepers, hinges, and provisions for padlocking.

a. Gate Frames:
Gate frames shall be constructed of tubular members (round or square) welded at all corners or assembled with fittings. On steel, welds shall be painted with aluminum based or zinc based paint. Where corner fittings are used gates shall have truss rods of 3/8-inch nominal diameter to prevent sag or twist. Gate leaves shall have vertical intermediate bracing as required, spaced so that no members are more than 8 feet apart. Gate leaves 10 feet or over shall have a horizontal brace or one 3/8-inch, diagonal truss rod. Dimensions and weights of gate frames shall be as shown in Table above. Gate filler shall be of the same fabric as specified for fence and shall be attached securely to gate frame at intervals of 15 inches.

b. Fabric:
Fabric shall be the same type as used in the fence construction. The fabric shall be attached securely to the gate frame at intervals not exceeding 15-inches.

c. Hinges:
Hinges shall be of adequate strength for gate, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

d. Latches, Stops, and Keepers:
Latches, stops and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates of openings less than 10 feet wide a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

2.7 POSTS

A. Posts shall be of the lengths specified and shall be tubular, except that line posts may be H-beam.

2.8 POST BRACES

A. Post braces shall be provided for each gate corner, pull, and end post and shall consist of a round tubular brace extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a rod not less than 3/8-inch in nominal diameter from the line post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

2.9 POST TOPS

A. Post tops shall consist of combination tops with barbed wire supporting arms. The top shall be provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of posts and shall exclude moisture from tubular posts.

2.10 SUPPORTING ARMS

A. Barbed-wire supporting arms shall be at an angle of approximately 45° and shall be fitted with clips or other means for attaching 3 strands of barbed wire. With 45° arms the top wire shall be approximately 12 inches horizontally from the fence line and the other wires spaced uniformly between the top of the fence fabric and the outside strand. Barbed-wire arm shall be of sufficient strength to withstand a weight of 200 lbs. applied at the outer strand of barbed wire.

2.11 TOP RAILS

A. Top rails shall be round (tubular), shall be in lengths not less than 18 feet, and shall be fitted with couplings for connecting the lengths into a continuous run. The couplings, shall be not less than 6-inches long, with .070 minimum wall thickness, and shall allow for expansion and contraction of the rail. Open seam outside sleeves shall be permitted only with a minimum wall thickness of .100 inches. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding 2 feet. Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

2.12 STRETCHER BARS

A. Stretcher bars shall not be less than 3/16 by 3/4 inch and not be less than 2" shorter than the full height of the fabric with which they are to be used. The stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through the fabric, by hand, or by other positive mechanical means. One stretcher bar shall be provided for each gate, and end post and two for each corner and pull post.

2.13 TIES OR CLIPS

A. Ties or clips of adequate strength shall be provided in sufficient number for attaching the fabric to all line posts at intervals not exceeding 15-inches.

2.14 BANDS OR CLIPS

A. Bands or clips of adequate strength shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding 15-inches. Tension bands and brace bands shall be formed from flat or beveled steel and shall have a minimum thickness of ± 0.115" after galvanizing with a minimum width of 7/8 of an inch ± 0.015".

2.15 SINGNAGE

A. A facility (such as a Wastewater Treatment Plant or Water Treatment Plant) containing an open tank must shall be provided with signs mounted on the fence stating “DANGER – OPEN TANKS – NO TRESPASSING” within visible sighting of each other and on each gate. Sign shall be white background with black lettering.

PART 3 – EXECUTION

3.1 GENERAL

A. All materials and workmanship shall be of first class in every respect, shall be done in a neat, workmanlike manner.

3.2 POST SPACING

A. Line posts shall be spaced at intervals not to exceed 10 feet average when measured from center to center between terminal posts.
In general, in determining the post spacing, measurement will be made parallel to the slope of the natural ground, and all posts shall be placed in a vertical position except where designated otherwise by the Owner or the representative of the Owner.

3.3 POST SETTING

A. All posts shall be set in holes of diameter and depth as indicated below. After the post has been set and plumbed, the hole shall be filled with 2,000 p.s.i. concrete. The exposed surface of the concrete shall be crowned to shed water.

Table of Post Hole Diameter and Depth

TYPE OF POST	HOLE DIA. @ TOP	HOLE DEPTH	POST EMBEDMENT
Line	9”	38”	36”
Corner	12”	38”	36”

3.4 TERMINAL POST

A. End, corner, gate and pull posts shall be set as shown herein before, and shall be braced to the nearest post with a galvanized pipe horizontal brace used as a compression member, and a galvanized 3/8-inch steel truss rod and truss tightener used as a tension member. All changes in direction of fence line of 30 degrees or more shall be considered as corners. Pull posts shall be used at all abrupt changes in grade.

3.5 CHAIN LINK FABRIC

A. Fabric shall be placed on the side of the fence as designated by the Owner or his representative. The fabric shall be stretched taut approximately 2-inches above the ground, and securely fastened to the posts. The fabric shall be cut and each span shall be attached independently at all terminal posts. Fastening to terminal posts shall be with stretcher bars and fabric bands spaced at maximum 15-inch intervals. Fastening to line post shall be with tie wire, metal bands, or other approved method, attached at maximum 15-inch intervals. The top edge of the fabric shall be fastened to the top rail with wire ties at intervals not exceeding 24-inches. The bottom edge of fabric shall be fastened to the bottom tension wire with wire ties at intervals not exceeding two feet. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

3.6 CANTILEVER GATE

A. The gate shall be comprised of standard chain link construction adhering to all requirements herein with a galvanized steel frame comprised of 2-3/8” full weight SCH 40 top and bottom members, 2” x 2” square tubing upright members (max 6’ spacing) and 1” x 1” square tubing cross bracing members between each upright member. The gate shall utilize vinyl cantilever

rollers above the gate and below the gate at all support posts for support. No rollers shall touch the ground and ground mounted track will be allowed.

B. Gate shall be operated by a motorized opener – see MEP specifications for compliance.

END OF SECTION 32 31 13

SECTION 32 33 13 – BIKE RACKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bicycle racks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Basis-of-Design Product: Subject to compliance with requirements, provide CycleSafe, Inc.; Bike U Rack with Crossbar or comparable product by one of the following:

1. Madrax; Graber Manufacturing, Inc.

B. Bicycle Rack Construction:

1. U/2 Round: 1.90” Stainless Steel Pipe 1. 2. 3.
2. Material: 1.5” ASTM A312 Schedule 40 Type 304 Stainless Steel Pipe.
3. Construction: Rolled 180 degree 10.1 inch IR bend x 35-3/4 inches high.
4. Installation Method: Ground mounted, cast in concrete.

C. Steel Finish: Manufacturer’s standard plastic coated finish.

1. Color: As selected by Architect from manufacturer's full range.

2.2 MATERIALS

A. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M or ASTM A666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A312/A312M.
3. Tubing: ASTM A554.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

E. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 STEEL AND GALVANIZED-STEEL FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

END OF SECTION 32 33 13

LANDSCAPE IRRIGATION - SECTION 32 84 00

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent: Furnish all labor, material, equipment, tools, and incidentals necessary for the installation of a complete and operational automatic Landscape Irrigation system as shown on the Drawings and as specified in this Section. The work includes:
   1. Trenching, excavation, backfill including base and backfill materials.
   2. Electrical and wiring/conduit work associated with the system.
   3. Maintenance of the system during the maintenance period.

B. Related work includes but is not limited to:
   1. Landscape Planting
   2. Landscape Maintenance

1.03 STANDARDS

A. Unless otherwise shown or specified, all materials and methods shall conform to the applicable current sections of:
   1. National Sanitation Foundation (NSF) Standard 61 Drinking Water System Components

B. ASTM International Standards (latest revisions) as they apply to this work and related test methods, including:
   1. D1784 Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
   2. D1785 Specification for Polyvinyl Chloride Plastic Pipe, Schedules 40, 80, and 120
   3. D2241 Specification for Polyvinyl Chloride Pressure-Rated Pipe (SDR)
   4. D2287 Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
   5. D2464 Specification for Threaded Polyvinyl Chloride Plastic Pipe Fittings, Schedule 80
   6. D2466 Specification for Polyvinyl Chloride Plastic Pipe Fittings, Schedule 40
   7. D2467 Specification for Polyvinyl Chloride Plastic Pipe Fittings, Schedule 80
   8. D2564 Specification for Solvent Cements for Polyvinyl Chloride Plastic Piping Systems
   9. D2609 Specification for Plastic Insert Fittings for Polyethylene Plastic Pipe
   10. D2672 Specification for Joints for IPS PVC Pipe Using Solvent Cement
   11. D2737 Specification for Polyethylene (PE) Plastic Tubing
   12. D2855 Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride Pipe and Fittings
   13. D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
   14. F690 Standard Practice for Underground Installation of Thermoplastic Pressure Piping Irrigation Systems

C. All materials and methods shall conform to the applicable standards of the following organizations:
   1. American Society of Irrigation Consultants (ASIC) Design Guidelines for Earth Grounding Electronic Equipment in Irrigation Systems
   2. American Water Works Association (AWWA) Standards
   3. American Welding Society (AWS) Specifications
   4. Copper Development Association: Copper Tube Handbook.
   5. Manufacturers Standardization Society (MSS) Standards

6. National Electrical Manufacturers Association (NEMA) Standards
7. Underwriters Laboratories (UL) Standards

1.04 REVIEWS

A. Contractor shall specifically request at least (2) two days in advance the following reviews prior to progressing with the work:
   1. Preliminary Review-II – Main-line layout, trenching, pressure-test.
   2. Intermediate Review - Irrigation coverage, controller location. Requirements for irrigation coverage inspection are specified herein.
   3. Substantial Completion Review - valve box inspection, and overall operation of the irrigation system.
   4. Final Review (at the completion of Maintenance Period) - all punch-list items identified at Substantial Completion Review.
   5. See Specification Sections Soil Preparation, Landscape Planting, and Landscape Maintenance for other items to be inspected during these reviews.
   6. Each review shall be conducted only after all items pertaining to that review as noted above and in related Sections have been completed by the Contractor.

1.05 QUALITY ASSURANCE

A. All materials shall be new and of the best quality available unless otherwise specified. Manufacturer shall be clearly marked on all material, containers, or certificates of contents for inspection.

B. Submittals: Within fourteen (14) days after Notice to Proceed submit:
   1. Product data on all specified irrigation equipment, including any proposed substitutions.
   2. Controller manufacturer’s recommended grounding details.

C. Certification: Prior to the Substantial Completion Review submit to the Architect:
   1. Written statement that the controller has been grounded adequately from the controller manufacturer’s representative or other qualified testing professional.
   2. Written statement that the communication system has been installed correctly from the controller manufacturer’s representative.
   3. Written statement that the decoder system, including grounding, has been installed correctly from the decoder system manufacturer’s representative.

D. Maintenance Binder: As specified herein.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Exercise care in loading, unloading, storage, and handling of pipe, fittings, and irrigation equipment.

B. Any pipe / fittings that have been cracked, dented, or otherwise damaged shall be removed from the site. If installed, pipe / fittings shall be replaced with undamaged piping / fittings to the satisfaction of the Architect at no additional cost to the Owner.

1.07 UTILITIES

A. Contractor shall verify location of all on site utilities prior to trenching. Notify Architect by telephone and in writing of any conflicts prior to installation. Restoration of damaged utilities shall be made at the Contractor's expense to the satisfaction of the Architect.

1.08 CODES

A. Irrigation system and electrical power to controller shall be installed and tested in accordance with TCEQ, local codes, and manufacturer's specifications.

1.09 TESTING

A. The backflow preventer shall be tested and approved by a licensed testing agency prior to substantial completion. Submit test results certificate to Owner as part of Substantial Completion review for Landscape Maintenance Period authorization.

PART 2 - PRODUCTS

2.01 PLASTIC PIPE AND FITTINGS

A. Unless otherwise noted:
   1. Lateral pipe shall be Class 200 PVC, Solvent Weld Joint.
   2. Mainline for pipes up to 2.5” diameter shall be SCH-40 PVC, Solvent Weld Joint.
   3. All PVC solvent weld fittings for lateral piping shall be Schedule 40 PVC.
   4. Main line fittings shall be Schedule 40 PVC.
   5. All threaded fittings for lateral pipe shall be Schedule 40 PVC heavy wall.
   6. All main line threaded fittings shall match the pipe type.
   7. All risers and nipples shall be Schedule 80 PVC, molded thread. Machine threaded nipples shall not be allowed.
   8. Plastic threaded fittings shall have Permatex #2 thread sealant with Teflon or equal.
   9. PVC cement shall be IPS (Industrial Poly Chemicals) for solvent weld, with associated primer to fit pipe type and size.

2.02 DRIP IRRIGATION

A. Approved manufacturers of drip irrigation products:
   1. Agrifim by NDS, Fresno CA, (800) 688-8108 www.ndspro.com
   2. Netafim, Fresno CA (888)638-2346 www.netafimusa.com
   3. Rainbird, Azusa CA (800)458-3005 www.rainbird.com
   4. Toro, Riverside CA (877)345-8676 www.toro.com

B. Supply system:
   1. Valve Assembly: solenoid valve, filter, and pressure regulator shall be as specified on the Drawings.
   2. Laterals, supply / exhaust headers shall be specified under Plastic Pipe and Fittings in this Specification, size per the Drawings.

C. Accessories:
   1. Flush valve where shown on the Drawings.
   2. Air-relief valve by manufacturer where shown on the Drawings.
   3. Fittings shall be as provided by the drip irrigation pipe manufacturer.
   4. Stakes / staples shall be as provided by the drip irrigation pipe manufacturer.

D. Surface Drip*:*
   1. Dripper line: as shown on the Drawings.
   2. Use manufacturer’s blank tubing to transport water across locations where irrigation is not required and as shown on the Drawings.

2.03 SLEEVING

A. All main and lateral lines located beneath paving shall be sleeved with Schedule 40 PVC pipe unless otherwise noted.
   1. For pipes, sleeves shall be 4” dia. or twice the aggregate diameter of all pipes contained within the sleeve, whichever is greater.
   2. For conductors, sleeves shall be a 1” dia. or sized per the conductor requirement, whichever is greater.

2.04 VALVE BOXES

A. Valve boxes: Pre-cast bolt-down plastic by Carson Industries LLC, or approved equal, free of all cracks, chips or structural defects. Size as required by equipment plus adequate clearance to operate valves unless otherwise noted.
   1. Boxes subject to vehicular traffic shall be concrete and have traffic lid covers.
   2. All valve box lids shall be labeled with the valve station number using a weather resistant method. Plastic valve box lids may be labeled with the valve station number using a branding tool / branding iron.
   3. Plastic valve boxes in turf areas shall be green color unless otherwise noted.
   4. Plastic valve boxes in planting / mulch areas shall be black color unless otherwise noted.

B. Valve identification tags: as manufactured by Christy Enterprises, Anaheim CA, (800)258-4583, or approved equal.
   1. A Valve ID tag, with the valve station # clearly marked with weatherproof method, shall be attached to the inside of each remote control valve, and attached by means of a weatherproof tie.

2.05 IRRIGATION EQUIPMENT

A. As shown on the Drawings, or approved equal.

2.06 CONDUCTORS

A. Control Wire: Type UF, 600V, copper, common ground white, UL listed for irrigation control use.
   1. Minimum wire gauge #14, use gauge appropriate to distance to account for voltage loss.
   2. PVC (polyvinyl chloride) or PE (polyethylene) insulation.
   3. Splices shall be sealed in wire-nut & resin or epoxy filled envelopes. Direct bury splice kits DBY/DBR by 3M, Scotchcast 3570G by 3M, or approved equal.

B. Controller Power: See Electrical Specifications.

2.07 CONDUIT

A. Conduits: See Electrical Specifications

PART 3 - EXECUTION

3.01 GENERAL

A. Acceptance of Work: Site grading shall be completed and/or accommodated to specified tolerances before trenching. The contractor shall be responsible for verifying the existing conditions on site and the removal and or reinstallation required making the grades.

B. Schematic: System features are shown schematically for graphic clarity. Install all piping and valves in common trenches where feasible and inside planting areas.

C. Coordination: Coordinate trenching as required with trenching contractor as well as with any other trades affected by irrigation installation. Coordinate installation of pipe and other irrigation equipment with other existing and proposed utilities and planting locations.

D. Grading: Contractor shall be responsible for installing all irrigation features to their finished elevation and at depths indicated.

E. Finish Grade: Unless otherwise noted, all heads shall be set at, and perpendicular to, finish grade.

F. Record Drawings of As-Built Conditions: Contractor shall regularly update a print of the system and any changes made to the system throughout the project.
   1. Features below ground shall be indicated with at least two measurements from surface features such as pavements, fences and buildings.
   2. Indicate actual control and ball valve and quick coupler locations in a similar manner. Indicate locations for valve boxes for intermediate control wire splices.
   3. All final changes shall be recorded on a reproducible plan before trenches are backfilled. The as-built plan shall be completed and submitted to the Architect before final payment shall be made for work installed.

G. Guarantee: Contractor shall guarantee irrigation system for one year from date of acceptance.

3.02 INSTALLATION

A. Point of Connection: shall be below grade.

B. Trenching: Trenching for mainline, sleeves, and laterals shall be to the required depths as shown on the Drawings. Maintain excavations free of water while installing pipe and until backfilled.

C. Pipe: pipes shown parallel on the Plan may be installed in a common trench. Where required, snake pipe from side to side when trench exceeds 30 feet in length.
   1. Where pipes are shown parallel to or adjacent to shrub or ground cover areas, they shall be installed in these areas.
   2. Where pipes are shown parallel to or adjacent to lawn areas versus pavement, they shall be installed in the lawn area. All changes in depth of pipe shall be accomplished using 45 degree fittings.

D. Sleeves: Contractor shall adequately size sleeves for all wiring and irrigation lines to be placed (with ends clearly marked above grade) under driveways and walks prior to their construction.
   1. Sleeves shall continue a minimum of 1 foot into planting areas.
   2. All wiring shall be in a separate sleeve.
   3. Install removable non-decaying plugs, expanding insulation foam or equal, at ends of sleeves and conduits to prevent entrance of earth.

E. Fabrication: All manifolds shall be neat, orderly, and constructed for ease in maintenance operations. Install manifolds to allow valve boxes to be parallel to each other and to adjacent walls, walks, and curbs. Cuts and joints shall be free of burrs, smooth and minimum in quantity.

F. Irrigation Equipment:

   1. Install irrigation equipment as shown on the Drawings.

G. Backfilling:
   1. Cover no joints until system has been pressure tested and approved by the Architect. Level bottom trenches for a smooth flat grade, and excavate bell holes where necessary to ensure that pipe rests for entire length on solid ground. Should rock or other unsuitable material be encountered, excavate to 6" below bottom of pipe and replace with well tamped and

compacted approved backfill material or sand before laying pipe. When piping has been installed, tested, inspected, and approved, backfill excavations with clean earth from excavation, or with imported sandy soil in layers not exceeding 8". The top 6" of the trenches shall contain on-site near surface soils. Backfill with potentially damaging rocks and debris shall not be permitted. Moisten and machine tamp, and restore the ground or paving to original condition.

2. Backfill shall be compacted per specification, see Specification Section Earthwork and Grading.
3. After backfilling, remove from the premises all surplus earth resulting from this work and dispose of same, to the satisfaction of the Architect.

H. Flushing of System: After installation of pipe lines and sprinkler risers, but before installation of sprinkler heads, thoroughly flush the system under full water main pressure to remove any foreign material in the pipes. Backfill and settle soil. Rake smooth to match surrounding grade.
   1. Check grade tolerance with 10’ straight edge across each head.
   2. Flushing shall include flushing out the existing mainline.

I. Sprinkler heads: Install heads as shown on the Drawings. Spacing of heads shall not exceed that shown on the Drawings, unless verified in advance with the Architect.

J. Coverage Adjustments: Adjust all heads for arc, radius, riser height, and distribution for uniform and optimum coverage, and eliminate overspray onto paved surfaces and structures. Such adjustments shall include nozzle changes without additional cost to the Owner.
   1. Verify that locations of and flow from dripper line is optimum for each root ball watering.

K. Valve Boxes: Install valve boxes so that the top of box is ½” above finish grade in turf areas and 1-½” above finish grade in mulch areas. Install valve box assembly in ground cover / shrub and not in hard paved areas. Install in lawn area only if groundcover does not exist adjacent to lawn.
   1. Each valve shall have a valve-identification tag, the corresponding valve box cover shall be branded with the valve identification number.

L. Clean-up: Keep project area clean on a daily basis, removing debris from the site.

3.03 CONTROL WIRE

A. General: Install control wire in pipe trenches wherever practical. All wire shall be installed below or level with the bottom of adjacent pipes. Where pipes are not available, control wire shall be installed inside conduits as specified in this section.
   1. Bundle wire and tape to pipe every 10 feet. Conduits or sleeve required shall be sized based on control wires as specified herein.
   2. All wiring above finish grade shall be enclosed in steel conduit.
   3. Color of control wire shall be different than pilot wire.
   4. One solenoid valve per station unless otherwise indicated on the Drawings or with prior approval of the Architect.
   5. All wiring shall be tested for continuity, open circuits and unintentional grounding prior to connecting.

B. Splices: shall be sealed with direct bury connectors as specified in this section.
   1. All intermittent wire splices between valves or between controller valves shall be installed in a valve box, locations as approved by the Architect.

C. Additional wire: Control wire for unused stations shall be pulled as noted on the Drawings.
   1. Provide 24" excess wiring in each valve box / pull box and in the nearest project valve box at 100-ft intervals on wire runs of greater than 100-ft. Neatly coil in valve box or pull box.

3.04 DRIPPER LINE INSTALLATION

A. Install all drip line and equipment as indicated on drawings. Follow equipment Manufacturers Instructions.

B. Bury all supply and distribution pipes to the depths shown on the Drawings.

C. Snake the distribution pipes through the planting to allow for expansion and movement. Do not kink the pipes, use right angle connectors in tight corners.

D. Install metal wire staples / anchors at 3' on center, and two (2) staples / anchors on each change of direction (tee, elbow, or cross).

3.05 CONTROLLER

A. General: The Contractor is advised that based on existing soil types, soil imports, and final ground conditions, additional grounding equipment may require to be installed at no extra cost to the Owner.
   1. Submit manufacturers grounding equipment details recommended for the Project.

B. Installation: Securely fasten to interior wall per the Drawings.

C. Power: Install power to controller following all applicable electrical codes. Install GFCI switch and 9-volt battery.
   1. For multiple controllers – each controller shall have a separate, dedicated common.

3.06 VALVE STATIONING

A. Contractor shall clearly label and sequence stations according to the assigned valve identification numbers shown on the Drawings. In case valve sequencing needs to be changed for ease in maintenance operations, verify changes in advance with the Architect. Final valve stationing shall be marked clearly on the as-built Drawings.
   1. Valve-stationing Plans: Provide laminated copies 11x17 size, of the As-built Irrigation Drawings with color-coded valve zones, for reference purposes inside the controller.
   2. Include a copy of the Valve-stationing Plans in the Maintenance Binder.

3.07 PRESSURE TEST

A. Pressure Test:
   1. Notify the Owner a minimum of two (2) working days prior to pressure test.
   2. Contractor shall furnish all equipment and temporary connections required for tests at no additional cost to the Owner.
   3. Exercise caution in filling the system to prevent excessive surge pressure and water hammer.
   4. Pipe subject to continuous water pressure (pressure lines) shall be tested at 125 lbs. of hydro-static pressure for two hours with a maximum 5 PSI drop. Repair any leaks, if necessary, and re-test.

B. Closing in Un-inspected Work: The Contractor shall pay all costs necessitated by requiring opening, restoration and correction of all work closed in or concealed before inspection, testing as required and approval by Architect. Notify Architect 48 hours in advance of required testing.

3.08 IRRIGATION COVERAGE

A. Inspection of irrigation coverage shall take place during the Intermediate Review, as specified herein.
   1. The Contractor shall, in the presence of the Architect, perform a coverage and operation test to determine if the system is fully operational.
   2. If it is determined that adjustments in the irrigation equipment and the re-spacing of heads and/or relocation of emitters will provide more complete coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle or emitter sizes and degrees of arc as necessary.
   3. The Contractor shall be responsible for making changes and obtaining complete and adequate coverage in all irrigated areas at no additional cost to the Owner.

3.09 HARDWARE

A. See Specification Section Landscape Maintenance for items to be handed over to the Owner at the in-service meeting.

3.10 MAINTENANCE BINDER

A. Submit at the time of Substantial Completion Review, a Maintenance Binder with the following documents:
   1. Sheet containing:
      a. Contractor's name, address, and phone number.
      b. Controller assembly manufacturer's name, address, and phone number – if applicable
      c. Controller manufacturer's service address, and phone number
   2. Copies of the following documents:
      a. Valve-stationing Plan
   3. Warranties and Certificates. Warranty documents or accompanying letters on company letterhead shall note project name and location and effective start date for warranties.
      a. Irrigation Controller Warranty.
      b. Backflow Prevention Device testing certificate.

B. The Maintenance Period shall not commence until the Maintenance Binder has been reviewed and approved by the Architect.

END OF SECTION

SOIL PREPARATION - SECTION 32 91 13

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent: Furnish all labor, material, equipment, tools, and incidentals necessary for Soil Preparation of planting areas as shown on the Drawings and as specified in this Section. The work includes installation of soil amendments, finish grading and plant pit backfill.

B. Related work includes but is not limited to:
   1. Landscape Planting

1.03 REVIEWS

A. Contractor shall specifically request at least (2) two days in advance the following review prior to progressing with the work:
   1. Intermediate Review – completion of site grading, amendment depths, finish grade.
   2. See Specification Sections Landscape Irrigation and Landscape Planting for other items to be inspected during this review.
   3. The review shall be conducted only after all items pertaining to the review as noted above and in related Sections have been completed by the Contractor.

1.04 SUBMITTALS

A. Test Samples: Contractor shall provide samples, as specified herein, to an agricultural soils testing laboratory approved by the Architect, referred to herein as the Testing Lab, unless delivered to the site in original, unopened containers, each bearing the manufacturer guaranteed analysis.
   1. Testing Lab – Soil, Water and Forage Testing Laboratory, 2610 F&B Road, College Station, TX 77845, (979) 845-4816 or prior approved equal.
   2. Use of an alternate soil testing lab without prior approval shall be cause for rejection of the submitted analysis.
   3. No material shall be delivered to the site until the Architect approves the material.
   4. The same Testing Lab shall be used for all tests specified herein.
   5. Contractor shall pay for all testing fees from the Testing Lab for all tests specified herein.

B. Product Certificates: Certification stating quantity, type, and composition, weight and origin for all amendments and chemicals shall be delivered to the Architect within fourteen (14) days of the Notice to Proceed and before the material is delivered to the site.

C. Testing – Existing Soil: Prior to finish grading operations or at least four weeks before proposed planting operations, Contractor shall take a sample each of the topsoil and sub-soil, from 0”-12" deep, in three separate locations across the site after rough grading, as directed by the Architect. Samples shall be mixed from the twelve locations to provide a composite sample, representative of the entire site, combined volume of samples not less than 2 quarts. Soil samples shall be forwarded to the Testing Lab by the Contractor for testing and recommendations as to exact fertilizers and soil amendments to be used in planting, analysis tests 7 and 10 or approved equal.
   1. Amendment and fertilizer recommendations by the Testing Lab shall be specific to the proposed amendments to be used. Generic recommendations will require the Contractor to re-obtain specific recommendations from the Testing Lab.
   2. Soils report shall include an estimated infiltration rate for the tested soils.

D. Testing – Amendments: Contractor shall provide, along with a sample, latest analysis of amendments / bulk organic materials by the Testing Lab for verification of conformance to this specification, and specific recommendations as to exact quantities to be used in planting.
   1. Analysis shall conform to physical and chemical properties specified herein.
   2. Analysis shall not be more than three months old at the time of submitting sample.

E. Testing – Imported Topsoil: Contractor shall provide, along with sample, latest analysis of soil proposed to be imported (if any) by the Testing Lab for testing as to exact fertilizers and soil amendments to be used in planting.

   1. Submit certificate or sample of any proposed bulk organic materials simultaneously for testing with soil samples for optimum amendment recommendations.
   2. Analysis shall not be more than three months old at the time of submitting sample.
   3. Should the final soil mixture be a combination of existing soil and imported topsoil, Contractor shall provide additional lab recommendations on method of mixing and exact fertilizers and soil amendments to be used in planting for the mixture.

F. Submit delivery tags for all amendments and fertilizers delivered to the Site for the Project.

1.05 PROTECTION

A. Protect concrete from any sulfate-based amendments that may be specified from soils analysis to avoid staining. Concrete damaged from amendment placement shall be replaced at the Contractor's expense.

PART 2 - PRODUCTS

2.01 EXISTING SOIL

A. Topsoil: The top layer of existing soil in planting areas below the grass root zone, containing minerals and organic materials including humus. Depth of topsoil shall be taken to be 2-4 inches deep or as determined by the Architect at the time of construction after clearing and grubbing. See Specification Section Site Clearing.
   1. At turf areas topsoil starts below the grass root zone.
   2. At planting areas other than turf, topsoil starts below the mulch and organic matter layer (O horizon).
   3. Soil underneath paving and aggregate base areas shall not be considered as top soil.

B. Sub-soil: Shall be the remaining existing soil on the site after clearing & grubbing, after topsoil has been removed, and after all rocks over one cubic inch and all foreign debris and organic material have been removed.
   1. Soil under paving and aggregate base areas shall be considered as subsoil provided contamination testing as specified elsewhere in this section indicates that it is free of contaminants that are harmful to plant growth.

2.02 IMPORTED TOPSOIL

A. Imported Topsoil: USDA classification of fraction passing a 2.0 mm seive: Shall be loose, friable silty clay, free of harmful insects, all weed growth, clods over 1" and/or clods that will not be pulverized during operations, and free of rocks.

1. Class | particle size range | maximum % | minimum %

Class	particle size range	maximum %	minimum %
Coarse sand	0.5 - 2.0 mm	30	15
Silt plus clay	<0.05mm	50	15
Other classes			
Organic		15	5

2. Chemistry - Suitability Considerations

Salinity: Soil Saturation Extract (ECe) - Less than 4.0 dS/m (mmhos.cm) @ 25° C.
Sodium: Sodium Adsorption Ratio (SAR) - Less than 6.0
Boron: Saturation Extract Concentration - Less than 1.0 ppm
Reaction: pH of Saturated Paste – 5.5-7.0

3. Fertility Considerations: Soil to contain sufficient quantities of available nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials prior to planting.

2.03 FERTILIZER

A. Fertilizer shall be the following:
1. Commercial fertilizer: for soil amendment shall be 16-6-8 (N-P-K) uniform pellet.
2. Commercial fertilizer packets: for plants shall be controlled-release three year 16-8-8 (N-P-K) by Nutri Pak.
3. The requirements above are for bidding purposes only, exact fertilizer types to be determined by Testing Lab analysis.

2.04 SOIL AMENDMENTS

A. Nitrogen Stabilized Organic Amendment: shall be mineralized and nitrogen stabilized bark or sawdust humus, with wetting agent and properly pulverized and shall have a minimum of 270 lbs. per cubic yard of amendment. Submit sample analysis for approval.

B. Gypsum: Agricultural Grade

2.05 CHEMICALS

A. The following brand names of various chemicals to be used in this Section are provided for ease of specifying; equals or brands with similar chemicals that will match or improve performance may be used at the Contractor's discretion. Contractor shall verify use of any chemicals with Architect prior to application:
1. Pre-emergent herbicides - (granular form only) “Treflan “ or “Ron Star “
2. Post-emergent herbicides

PART 3 - EXECUTION

3.01 GENERAL

A. Limits and Grades: Prior to commencing soil preparation operations, Contractor shall request a review by the Architect to verify specified limits of soil preparation work to commence. Soil amendment limits include all naturalized areas unless otherwise noted.

3.02 IMPORTED TOPSOIL PLACEMENT

A. If required, imported topsoil shall be installed and completed as necessary to produce final finish grade requirement.

B. Sub-grade shall be cross-ripped or cultivated to a depth of 10 inches. Water shall be added and ripping or cultivation shall be continued until the entire 10 inch depth is loose and friable. Place topsoil uniformly over sub-grade and thoroughly cultivate and bring to a smooth, even grade. Soil shall be thoroughly water settled and high/low areas re-graded in accordance with paragraph "Finish Grading" this Section.

3.03 AMENDMENT PLACEMENT

A. The requirements below are for bidding purposes only, adjustments to the bidding formula shall be determined by the Testing Lab analysis.

B. All planting areas including seeded areas shall be thoroughly cross-ripped to a minimum 10 inch depth. Upon completion of cross-ripping the amendments shall be applied, including the naturalized areas, as follows:

Amount/1000 Square Feet	
6 cubic yards	Nitrogen Stabilized Organic Amendment
12 lbs.	Commercial Fertilizer
50 lbs	Gypsum

C. The materials shall then be uniformly spread and incorporated to obtain a homogeneously blended soil, six inches in depth.

D. Plant pits: Soil which has been amended in the above manner shall be used as the backfill mix around the sides of the root balls. See Specification Section Landscape Planting for plant pit requirements.

3.04 FINISH GRADING

A. Contractor shall finish grade all planting areas unless otherwise noted, and shall remove all rocks and clods over one cubic inch. In lawn areas, all rocks and clods shall be removed. All areas shall be smooth and uniformly graded. All erosion damage during the construction period shall be repaired by the Contractor.

B. Unless otherwise noted, all soil finish grades shall be 1/2 inch below finish grade of walks, pavements, and curbs.

3.05 CHEMICALS

A. Herbicides and pesticides: Contractor shall verify compatibility, dosage and other application procedures with the manufacturer. All chemicals shall be applied by a pest control operator licensed in the State of Texas.

B. Planting areas: Treat all ground cover and non-seeded areas for weed control with pre-emergent herbicide, as recommended by the manufacturer. See Specification Section Landscape Maintenance for related work.

C. Seeded areas: After cross-ripping specified earlier and after weed germination from first rains or Contractor applied water, spray naturalized areas with post-emergent herbicides. Weeds shall be sprayed prior to going to seed and shall be at least 2" tall. This process shall take place over a minimum of two weeks. Upon weed kill, seeding shall be applied per Specification Section Landscape Planting.

D. Include copies of documentation of pesticide and herbicide applications, countersigned by the Architect, in the Maintenance Binder – see Specification Section Landscape Maintenance.

3.06 FERTILIZER

A. All container stock shall receive additional fertilizer, in the form of commercial fertilizer packets at the rate of:

Container size	**Fertilizer Packets**
4-inch pot	one (1) packet
One gallon plant	two (2) packets
Five gallon plant	four (4) packets
Fifteen gallon plant	ten (10) packets
24" box	fifteen (15) packets
36" box	fifteen (15) packets

1. Space the tablets evenly around the ball halfway up backfill touching side of root ball.
2. The requirements above are for bidding purposes only, exact application rates per Testing Lab analysis.

END OF SECTION

LANDSCAPE PLANTING - SECTION 32 93 03

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent: Furnish all labor, material, equipment, tools, and incidentals necessary for the provision and installation of plant materials as shown on the Drawings and as specified in this Section.

B. Related work includes but is not limited to:
   1. Soil Preparation
   2. Landscape Irrigation
   3. Landscape Maintenance

1.03 QUALITY ASSURANCE

A. Quality: Minimum quality of all plant material shall unless otherwise indicated conform to:
   1. ANSI Z60.1-2004 American Standard for Nursery Stock, Sponsored by the American Nursery and Landscape Association (ANLA)
   2. Additional standards as indicated on the Drawings and as specified herein.

B. Applicable ASTM International Standards (latest revisions) as they apply to this work and related test methods, including:
   1. C602 Specification for Agricultural Liming Materials
   2. D5268 Specification for Topsoil Used for Landscaping Purposes

1.04 SUBMITTALS

A. General: Within fourteen (14) days after Notice to Proceed submit the following:
   1. Documentation certifying quantity and species of plant material ordered, the nursery supplier(s), *any* plant material not available at that time, or proposed substitutions to be reviewed.
   2. Product data on all associated planting products specified herein.
   3. 4-ounce sample of mulch.

1.05 REVIEWS

A. Contractor shall specifically request at least (2) two days in advance the following review prior to progressing with the work:
   1. Intermediate Review – plant material approval and layout/locations. See Specification Sections Landscape Irrigation and Soil Preparation for other items to be inspected during this review.

B. Contractor shall specifically request at least (5) five days in advance the following reviews prior to progressing with the work:
   1. Substantial Completion Review (to initiate Maintenance Period) – all planting areas including turf. See Specification Section Landscape Maintenance.
   2. Final Review (at the completion of Maintenance Period) - all planting areas including turf and all punch-list items identified at Substantial Completion Review. See Specification Section Landscape Maintenance.

C. Each review shall be conducted only after all items pertaining to that review as noted above and in related Sections have been completed by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. Nomenclature and Labels: Plant botanical names conform to “Standardized Plant Names,” second edition. All plants of each clone, species, and cultivar shall be delivered to the site labeled with their full botanical name. Every plant species shall be labeled with no less than one label for every ten plants of a species.

B. Quantities: The quantities shown on the plant list and in labels are for the Architect's use and are not to be construed as the complete and accurate limits of the Contract. Contractor shall furnish and install all plants shown schematically on the Drawings.

C. Root Systems: All container-grown stock shall be grown in its container for at least six months prior to its planting. Contractor shall allow one percent of the quantity of plants for removal and inspection. Any plant material, within two years following the final acceptance of the project, determined by the Architect to be defective, restricted, declining or otherwise deficient due to abnormal root growth, shall be replaced by the Contractor, to the equal condition of the adjacent plants, at the time of replacement.

D. Health: Foliage, roots and stems of all plants shall be of vigorous health and normal habit of growth for its species. All plants shall be free of all disease, insect stages, burns or disfiguring characteristics.

E. Untrue Species: All plant material, within two years following the final acceptance of the Project, determined by the Owner to be untrue to the species, clone, and/or variety specified, shall be replaced by the Contractor, to the equal condition of adjacent plants at the time of replacement.

2.02 TREES

A. All trees shall have straight trunks of uniform taper, larger at the bottom. Trunks shall be free of damaged bark, with all minor abrasions and cuts showing healing tissue. Sucker basal growth and lateral growth shall be removed and treated to eliminate re-sprouting. Normal lower side branching shall remain. Trees unable to stand upright without support shall be rejected.

2.03 FERTILIZER

A. 20-10-15 (N-P-K) Commercial Fertilizer, uniform pellet.
   1. The requirements above are for bidding purposes only, exact fertilizer types per Testing Lab analysis.

2.04 TREE STAKES AND GUYING

A. Tree Staking
   1. Stakes: Peeled lodge pole pine logs, clean, smooth, new, and sized as follows:
      a. 2” dia x 8’ long for trees less than 8’ height
      b. 3” dia. x 8’-10” long for trees between 8’-10’ height.
      c. Stake height per requirements of plant – see planting details.
   2. Ties: Flat rubber ties 24” minimum length. Use roofing nails of adequate length to firmly attach ties to stake.

B. Palm Staking shall be as shown on the plans.

2.05 MULCH

A. Shall be brown shredded hardwood product greater than 1/2 inch and less than 2 inch in length, and no more than 1/2 inch thick, and shall contain less than 1% foreign matter including soil, weeds, seeds, etc. by dry weight.

2.06 TURF SOD

A. Sod shall be grown from high quality seed in soil treated with appropriate State and Federal agency approved pesticides, fungicides, and herbicides and regularly inspected by the State.
   1. Sod shall have a well-developed root structure sufficiently mature so that it will hold together when held by one end of the roll.
   2. Yellowing, brown, diseased, dried, or pest infested sod shall be rejected.
   3. Soil thickness of the sod shall be 1/4 inch to 5/8 inch thick excluding top growth and thatch.
   4. Size of rolls or slabs shall be consistent to the supplier's standard length and width and is not to vary by more than 2% in either dimension.
   5. See submittal requirements for sod soil as specified herein.

B. Sod shall be Celebration Bermuda.

2.07 ROOT BARRIERS

A. Tree root barrier shall be locking panel type, fabricated from a high density and high impact extruded ABS, Polyetheylene, or Polyproylene with 50% post-consumer recycled plastic, with a mean thickness of 0.08". Plastic shall have 1/2 - 3/4 inch high raised vertical ribs on the inner surface spaced not more than 6-8 inches apart. Length and layout of root barrier to be per the Drawings. Root barrier shall be one of the products below, or approved equal:

B. Approved Manufacturer:
   1. DeepRoot (800) 458-7668. Depth to be 24".

PART 3 - EXECUTION

3.01 GENERAL

A. Plant Material Approvals: Before planting operations commence, all plant material shall be reviewed by the Architect. Defective plants shall be removed from the site and acceptable material substituted in its place. The review does not accept defective plants which may be installed.

B. Layout: Only those plants to be planted in any single day should be laid out. Locations of all plants shall be reviewed prior to planting. Plants installed without this review may be transplanted/relocated as directed by the Architect.

C. Protection of Plants: Contractor shall maintain all plant material in a healthy growing condition prior to and during planting operation. Contractor shall be responsible for vandalism, theft, and damage to plant material until commencement of the maintenance period.

D. Pruning: Contractor shall do no pruning without specific authorization of the Architect. Plants pruned without authorization shall be replaced by the Contractor if necessary.

3.02 PLANT PITS

A. Rootball shall rest only on undisturbed soil, or in the case of fill areas, on compacted, un-amended sub-grade. See Specification Section Soil Preparation for backfill mix requirements. Plant rootball and pits shall have their sides and bottoms loosened and otherwise broken to prevent glazing or compaction.

1. Plant pit sizes shall be as shown on the Drawings.
2. Plant pits in paved areas shall extend to the edge of the planter opening in all directions unless otherwise noted on the Drawings.

3.03 TREE AND SHRUB INSTALLATION

A. Watering basins: Construct basins as required to water plants during establishment period. Basin bottoms shall drain away from plant stems. See Specification Section Landscape Maintenance for removal of basins.

B. Staking: All trees shall be staked unless otherwise noted on the Drawings. Install stakes as per the Details.
   1. Stakes shall be driven securely into existing soil on the windward side of the tree. A minimum of two figure-eight, rubber tree ties shall be required.
   2. If using rubber ties without wire, nail rubber ties to the back of stakes in areas of severe wind conditions

3.04 CHEMICALS

A. Pesticide: Contractor shall verify compatibility, dosage and other application procedures with the manufacturer. All pesticides shall be applied by a pest control operator licensed in the State of Texas.

B. Include copies of documentation of pesticide applications, countersigned by the Architect, in the Maintenance Binder – see Specification Section Landscape Maintenance.

3.05 FERTILIZER

A. Apply Commercial Fertilizer at 5 pounds per 1,000 square feet to all planting areas including turf, 30 days after planting. Re-application shall be scheduled at 45 day intervals until completion of Landscape Maintenance.
   1. The requirements above are for bidding purposes only, exact application rates per Testing Lab analysis.

B. Include copies of documentation of fertilizer applications, countersigned by the Architect, in the Maintenance Binder – see Specification Section Landscape Maintenance.

3.06 MULCH

A. Install mulch to a minimum depth of 3 inches – see the Drawings for areas to be covered. See finish grading in Specification Section Soil Preparation.

3.07 SOD INSTALLATION

A. The installation specifications below shall prevail over the sod grower's installation specifications, unless otherwise noted.

B. Grading / Soil Preparation: Finish grade to smooth, even surface, allowing for sod thickness at pavement and other structures to leave the sod flush to the finish grade of adjacent surfaces. The soil surface shall be sufficiently firm to resist impressions over 1/4 inch deep, and shall be lightly rolled until meeting this firmness. The top six to eight inches of soil shall be watered until this zone has an optimum moisture content for root growth.

C. Installation: Sod shall be laid in rows with staggered ends neatly and tightly butted on all edges. Harvesting netting shall be removed upon installation. Sod shall be protected from wind and sun exposure during storage, with a maximum storage period of twenty-four hours. No overlap, gaps, ripples, or other uneven placement will be accepted. Contractor shall lightly roll sod after installation to insure optimum contact with the soil. Trimming and cutting around structures shall

be completed with sharp tools and carefully fitted so the final appearance is a solid, continuous turf.

D. Establishment Watering / Mowing: Follow sod grower's specifications.

E. Rolling: The field sod shall be allowed to grow for a minimum of two weeks before rolling. Roll both in length and width.

3.08 ROOT BARRIER

A. Install root barrier panels around trees planted within 5' of foundations, walls, curbs, and paving. Install per manufacturer's instructions, and as shown on the Drawings. Irrigation lines shall not penetrate root barrier.
   1. At tree planters in paved areas root barrier shall be at the edge of the planter unless otherwise noted on the Drawings.
   2. The top of the root barrier shall be ½-inch above the soil surface.

3.09 MAINTENANCE

A. See Specification Section Landscape Maintenance

3.10 CLEAN UP

A. After completion of all operations, Contractor shall remove all trash, excess soil and other debris. All walks, walls, and pavement shall be swept and washed clean. Leave the entire area in a neat, orderly condition.

END OF SECTION

INSTALLATION OF WATER PIPE
SECTION 33 05 05

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary for the installation of all pipe required to complete the potable water lines. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Concrete shall have a minimum compressive strength of 2000 p.s.i. at 28 days and shall be in accordance with Subsection 03 30 02 Normal Weight Aggregate Concrete.

2.2 ENCASEMENT SAND: See Subsection 31 23 16.13.

2.3 POLYVINYL CHLORIDE PIPE: See Subsection 00 05 31.16 and 33 05 31.29.

2.4 DUCTILE IRON PIPE: See Subsection 33 05 19.

2.5 GATE VALVES FOR WATERLINES: See Subsection 33 14 19.

2.6 FIRE HYDRANTS: See Subsection 33 14 19.13.

2.7 SEPARATION OF WATER AND SEWER LINES

A. Existing Water And New Sanitary Sewer

CONDITION	LOCATION	MATERIAL		MINIMUM SEPARATION		COMMENTS
		WATER	SEWER	VERT	HORIZ	
New Sewer Parallel Existing Water	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	2’	4’	Separate trenches
New Sewer Crossing Existing Water	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	6”	N/A	Center one joint of sewer pipe on water line.
New Sewer Crossing Existing Water backfill of 9’ each	Water Above Sewer	Std.	ABS, Clay Conc. Compos.	2’	N/A	Cement stabilize sand initial zone sewer for side of crossing. Center one joint of sewer pipe on water main.

B. New Water And New Sanitary Sewer

CONDITION	LOCATION	MATERIAL		MINIMUM SEPARATION		COMMENTS
		WATER	SEWER	VERT	HORIZ	
Sewer Force Main and Gravity Sanitary Sewer Parallel to Water Main	Water Above Sewer	Std.	CI-DI-PVC 150 psi	2’	4’	Separate trenches
Gravity Sanitary Sewer Crossing Water Main	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	6”	N/A	Center one joint of sewer pipe on water main
Gravity Sewer Crossing Water Main	Water Above Sewer	Std.	ABS-Clay-Conc Composite	2’	N/A	Cement stabilized sand backfill initial backfill zone of sewer for 9’ each side of crossing. Center one joint of sewer pipe on water main

C. New Water And Existing Sanitary Sewer

CONDITION	LOCATION	MATERIAL		MINIMUM SEPARATION		COMMENTS
		WATER	SEWER	VERT	HORIZ	
New Water Parallel Existing Sewer	Water Above Sewer	Std.	Clay - Conc ABS CI-DI-PVC	2’	4’	If sewer not leaking, leave sewer alone. If sewer leaking repair or replace.
New Water Crossing Existing Sewer	Water Above Sewer	Std.	ABS, Clay Conc Compos.	2’	N/A	If sewer not leaking, leave sewer alone. If sewer leaking repair or replace
New Water Crossing Existing Sewer	Sewer Above Water	Std.	ABS, Clay Conc. Compos.	2’	N/A	Replace existing sewer with one joint CI - DI PVC 150 psi centering over water line.
New Water Parallel to Existing Sewer	Sewer Above Water	Std.	ABS, Clay Conc. Compos.	2’	4’	Replace existing sewer with CI,DI PVC-150 psi or cement stabil. sand backfill in initial backfill zone of sewer where parallel closer than 9’ or encase the water in 150 psi pipe two nominal sizes larger.

PART 3 – EXECUTION

3.1 GENERAL

A. All water system materials and construction shall comply with the Texas Natural Resources Conservation Commission requirements.

3.2 HANDLING OF MATERIAL

A. Handling and Care:
Pipe and other materials shall be unloaded at the point of delivery, hauled to and distributed at the project site by the Contractor. They shall at all times be handled with care and in conformance with the manufacturer's recommendations. Whether moved by hand, skidways or hoists, material shall not be dropped or bumped against other material or objects already on the ground. Care shall be taken not to scratch the surface of P.V.C. pipe. Excessive scratching shall be considered cause for rejection of P.V.C. pipe.

B. Distribution at Site of Work:
Material may be unloaded opposite or near the place where it is to be used in construction provided it is to be incorporated into the work within 10 days. The Contractor shall distribute the material in such a manner so as not to cause the public any undue inconvenience. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

C. Storing Material:
Any material delivered to the project site that is not to be incorporated into the work within 10 days shall be stored on suitable blocks or platforms off the ground. Stacking of materials shall be done in such a manner that the material is not damaged.

3.3 ALIGNMENT AND GRADE

A. General:
All pipe shall be laid and maintained to the required lines and grades. Fittings, valves and hydrants shall be at the required locations and with joints centered, spigots home and all valve and hydrant stems plumb.

B. Depth of cover:

Unless otherwise shown on the construction plans, it is the intent of these specifications that water lines shall have minimum cover as follows:

(1) Below surface of proposed or existing paved areas ..... 42 inches
Depth of cover shall be measured from the surface of the existing or proposed pavement to the top of the pipe barrel.

(2) Below surface of unpaved areas on T. D. T. R.O.W. ..... 36 inches
Depth of cover shall be measured from the finished surface to the top of the pipe barrel.

(3) Below surface of all other unpaved areas ..... 30 inches
Depth of cover shall be measured from the finished surface to the top of the pipe barrel.

(4) Below surface of existing area to be filled ..... 18 inches
Depth of cover shall be measured from the existing surface to the top of the pipe barrel before any fill is placed to obtain finished grade.

If the established grades violate any of the before stated conditions notify the Engineer immediately so that remedial instructions can be given the Contractor.

C. Vertical deflection of water pipe:
It is permissible to use vertical deflection when crossing under other utilities or drainage facilities provided the depth of cover from the finished surface does not exceed 48”. When the depth of cover will exceed 48” the crossing shall be made by installing four ductile iron

bends with locking joints and retainer glands. All pipe between bends shall be DR 18 Polyvinyl Chloride Pipe (C900).

3.4 PIPE TRENCH EXCAVATION AND BACKFILL: See Subsection 31 23 16.13.

3.5 SAND AND ENCASEMENT

A. All pipe and fittings which are not enclosed in concrete valve vault or laid in encasement pipe, shall be completely encased with a minimum of 8" of sand. This encasement includes the bottom, sides and top of pipe and fittings including bells, so that all portions will be encased with a minimum of eight inches of sand to insulate the pipe from the natural ground and from the backfill. Sand shall be screened and free of foreign material. Sand shall be placed in a manner that will not injure the polyethylene wrapping and shall be compacted under, around the sides, and over the pipe in a manner that will reduce settlement to a minimum and as approved by the Water Superintendent.

3.6 TRENCH EXCAVATION SAFETY: See Subsection 31 23 16.13.

3.7 LOWERING PIPE AND ACCESSORIES INTO TRENCH

A. General:
Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe, fittings, valves, hydrants, and accessories shall be carefully lowered into the trench by means of derrick, ropes or other suitable equipment in such manner as to prevent damage. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. The Contractor shall not lay any pipe in the trench until the bedding and condition of the trench has been approved by the Engineer. The trench shall be free of water and maintained in that condition until pipe has been laid and the joints completed.

B. Inspection of Pipe and Accessories:
The pipe and accessories shall be inspected for defects prior to lowering into trench. Any defective, damaged or unsound pipe shall be replaced.

C. Pipe Kept Clean:
All foreign matter or dirt shall be removed from the interior of pipe before lowering into the trench. Pipe shall be kept clean by means approved by the Engineer during and after laying. Contractor shall not leave any trench unmanned until trench is covered, or until barricades are placed and pipe is at least temporarily plugged to prevent varmints from entering.

3.8 JOINTING PIPE

A. Joints shall be made up in strict conformance with manufacturer's recommendations, including the use of any primer or lubricant.

3.9 CONCRETE THRUST BLOCKING

A. Concrete thrust blocking shall be provided at the ends of all lines and changes in direction including tees and incomplete crosses and blow-offs. Thrust blocking shall be poured against undisturbed soil solid between ground and the fitting to be anchored. Thrust blocks shall be of sufficient size to keep the pipe in place when subjected to test pressure. The blocking shall be placed so that the pipe and fitting joints will be accessible for repair.

3.10 JOINT RESTRAINT

A. When soil conditions will not withstand thrust blocking, metal tie rods and clamps or ductile iron bends with locking joints and retainer glands shall be used to prevent movement. Steel rods

and clamps shall be galvanized or otherwise rust proofed or coated with hot coal tar enamel then wrapped with two layers of polyethylene wrapping.

3.11 STERILIZING WATER PIPE

A. Waterline shall be disinfected prior to use in accordance with the current standard AWWA C651-92. After sterilization period is completed, Contractor will flush lines and thoroughly clean. The City will take a bacteriological sample test 2 hours after refilling. If sample does not pass State Of Texas purification standards, then repeat above procedure. The entire sterilization process shall be coordinated with and under the supervision of the City Water Construction Superintendent.

3.12 HYDROSTATIC TESTING OF PRESSURE SYSTEM: See Section 33 05 05.31.

3.13 WATER CONNECTIONS

A. All connections to the water mains will be made by the contractor under supervision of CITY WATER DEPARTMENT. The Contractor shall supply all required materials, labor and match grade of the existing water line.

END OF SECTION 33 05 05

HYDROSTATIC TESTING OF PRESSURE SYSTEM
SECTION 33 05 05.31

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary for hydrostatically testing the completed sanitary sewer force main and potable water lines. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art SC-1 Definitions.

PART 2 – PRODUCTS

2.1 WATER FOR TESTING

A. All water for testing will be furnished by the Contractor. The Contractor shall make complete and satisfactory arrangements with the City's Water Department and make all necessary connections at his own expense.

PART 3 – EXECUTION

3.1 CONTRACTOR TESTING

A. The Contractor shall provide all equipment, materials, (including water, if required) and do all work necessary to conduct the following tests:
   a. Hydrostatic Test Of Water Lines
B. The tests shall be accomplished by the Contractor in the presence of the Engineer's or Owner's authorized representative. Tests results shall be signed by the Contractor's authorized representative who accomplished the testing and the Engineer's or Owner's authorized representative who witnessed the testing. Before final payment will be made to the Contractor 3 copies of all test results shall be furnished to the Engineer.

3.2 TEST PROCEDURES

A. After the pipe has been laid and partially backfilled, it shall be subjected to a hydrostatic pressure test. Before applying the specified test pressure, all air shall be expelled from the pipe. If necessary, the Contractor shall provide taps at points of highest elevation to bleed off pockets of air. Any taps made shall be provided with a corporation stop or tightly plugged when the line is full of water. The line may be tested in valved sections.

3.3 TEST PRESSURE, DURATION AND LEAKAGE

All pipes shall be subjected to two hydrostatic tests as follows:

a. Hydrostatic Test No. 1:
   (1) Duration: Two hours
   (2) Test Pressure:
      (a) Potable water lines:..... 150 P.S.I.
   (3) Allowable Leakage:
      (a) Water Lines: The allowable leakage shall be based on the following formula:

$$L = \frac{ND(P)\ 1/2}{7{,}400}$$

Where L = Allowable leakage in gallons per hour.
N = Number of joints in the length of pipe tested.

D = Nominal Diameter of Pipe in inches.
P 1/2 = Square root of pressure within the test section in psi.

Should any test of combined section of pipe laid disclose leakage greater than the specified limit, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance. Repairs and tests shall be repeated until the line shows no defects and is accepted by the Engineer.

b. Hydrostatic Test No. 2:
   (1) General: The second hydrostatic test shall be made no less than 48 hours after the successful completion of the first hydrostatic test.
   (2) Test Pressure And Duration:
      (a) Potable water lines:..... City pressure for 48 hours.
   (3) Allowable Leakage: There will be a zero leakage allowance during this test. During the test, all exposed pipe, fittings, valves, hydrants, and joints shall be carefully examined. If found to be leaking, they shall be corrected immediately by the Contractor. If the leaking is due to cracked or defective material, the defective material shall be removed and replaced by the contractor with sound material. The test then shall be repeated until the pipeline is accepted. No pipe installation will be accepted until the above conditions have been met.

END OF SECTION 33 05 05.31

INSTALLATION OF SANITARY SEWER PIPE (PVC-SDR26)
SECTION 33 05 05.11

PART 1 – DESCRIPTION

1.1 GENERAL

A. This specification shall govern for all work necessary for the installation of all sanitary sewer pipe (gravity flow) required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 CONCRETE

A. Concrete shall have a minimum compressive strength of 2000 p.s.i. at 28 days and shall be in accordance with Subsection 03 30 02 "Normal Wight Aggregate Concrete".

2.2 PIPE

SDR 26 PVC Pressure Rated Pipe: See Subsection 33 05 31.29.
SDR 26 and SDR 35 PVC Sewer Pipe: See Subsection 33 31 11.
(SDR 35 pipe shall not be used when ditch exceeds 6' in depth).

2.3 WATER AND SANITARY SEWER SEPARATION

A. New Water And Existing Sanitary Sewer:

CONDITION	LOCATION	MATERIAL WATER	MATERIAL SEWER	MINIMUM SEPARATION VERT	MINIMUM SEPARATION HORIZ	COMMENTS
New Water Parallel Existing Sewer	Water Above Sewer	Std.	Clay - Conc ABS CI-DI-PVC	2’	4’	If sewer not leaking, leave sewer alone. If sewer leaking repair or replace.
New Water Crossing Existing Sewer	Water Above Sewer	Std.	ABS, Clay Conc Compos.	2’	N/A	If sewer not leaking, leave sewer alone. If sewer leaking repair or replace.
New Water Crossing Existing Sewer	Sewer Above Water	Std.	ABS, Clay Conc. Compos.	2’	N/A	Replace existing sewer with one joint CI - DI PVC 150 psi centering over water line.
New Water Parallel to Existing Sewer	Sewer Above Water	Std.	ABS, Clay Conc. Compos.	2’	4’	Replace existing sewer with CI,DI PVC-150 psi or cement stabil. sand backfill in initial backfill zone of

sewer where parallel closer than 9' or encase the water in 150 psi pipe two nominal sizes larger.

B. New Water And New Sanitary Sewer:

CONDITION	LOCATION	MATERIAL		MINIMUM SEPARATION		COMMENTS
		WATER	SEWER	VERT	HORIZ	
Sewer Force Main and Gravity Sanitary Sewer Parallel to Water Main	Water Above Sewer	Std.	CI-DI-PVC 150 psi	2'	4'	Separate trenches
Gravity Sanitary Sewer Crossing Water Main	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	6"	N/A	Center one joint of sewer pipe on water main
Gravity Sewer Crossing Water Main	Water Above Sewer	Std.	ABS-Clay-Conc Composite	2'	N/A	Cement stabilized sand backfill initial backfill zone of sewer for 9' each side of crossing. Center one joint of sewer pipe on water main

C. Existing Water And New Sanitary Sewer:

CONDITION	LOCATION	MATERIAL		MINIMUM SEPARATION		COMMENTS
		WATER	SEWER	VERT	HORIZ	
New Sewer Parallel Existing Water	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	2'	4'	Separate trenches
New Sewer Crossing Existing Water	Water Above Sewer or Sewer Above Water	Std.	CI-DI-PVC 150 psi	6"	N/A	Center one joint of sewer pipe on water line.
New Sewer Crossing Existing Water	Water Above Sewer	Std.	ABS, Clay Conc. Compos.	2'	N/A	Cement stabilize sand backfill initial zone of sewer for 9' each side of crossing. Center one joint of sewer pipe on water main.

2.4 ALLOWABLE TRENCH WIDTH

A. The width of the trench from the bottom of the pipe to 12" above the pipe shall conform to the following:

Table I
Allowable Trench Width

Nominal Pipe Size	Minimum Trench Width - Inches	Maximum Trench Width - Inches
4	18	30
6	18	30
8	24	30
10	30	36
12	30	36

2.5 HORIZONTAL PIPE CURVATURE

A. Design Criteria Requirements:

When it is not possible for gravity sewers to be laid in straight alignment then the pipe shall be installed to meet the following horizontal curvature requirements.

B. Horizontal Pipe Curvature:
Pipe deflection for curvature shall be based upon pipe flexure. Joint deflection shall not be used. The minimum radius of curvature shall be 500' for pipe up to 12" in diameter.

C. Manholes:
Manholes spacing shall not be more than 300 feet.

D. Trench Excavation:
Excavation shall be parallel to the curvature of the pipe. Placement of the pipe shall be in the center of the trench and properly bedded.

PART 3 – EXECUTION

3.1 HANDLING OF MATERIALS

A. Handling and Care:
Pipe and other material shall be unloaded at the point of delivery, hauled to and distributed at the project site by the Contractor. They shall at all times be handled with care and in conformance with the manufacturer's recommendations. Whether moved by hand, skidway or hoist, material shall not be dropped or bumped against other material or objects already on the ground.

B. Distribution at Site of Work:
Material may be unloaded opposite or near the place where it is to be used in the construction, provided it is to be incorporated into the work within 10 days. The Contractor shall distribute the material in such a manner so as not to cause the public any undue inconvenience.

C. Storing Material:
Any material delivered to the project site that is not to be incorporated into the work within 10 days shall be stored on suitable blocks or platforms off the ground. Stacking of material shall be done in such a manner that the material is not damaged. Particular care shall be taken to keep the preformed joint material on the spigot end of the pipe from becoming dented or damaged.

3.2 ALIGNMENT AND GRADE

A. General: All pipe shall be laid and maintained to the required lines and grades.

B. Deviations With Engineer's Consent:
No deviation shall be made from the required line or grade except with the written consent of the Engineer.

C. Batter Boards:
The Contractor shall furnish and place in position as directed by the Engineer all the necessary batter boards for controlling the work. The batter boards shall be of such size timber as the Engineer directs and shall be substantially supported. The boards and all location stakes must be protected from damage or change of location. The Contractor shall also furnish good sound twilled lines for use in giving lines and grades, and the necessary plummets and graduated poles of a form approved by the Engineer.

D. Laser Equipment:
The Contractor may use laser equipment to maintain proper grade for laying pipe in lieu of batter boards as described above.

3.3 PIPE TRENCH EXCAVATION AND BACKFILL: See Subsection 31 23 16.13.

3.4 TRENCH EXCAVATION SAFETY: See Subsection 31 23 16.13.

3.5 LOWERING PIPE INTO TRENCH

A. General:
Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipes shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such manner as to prevent damage. Under no circumstances shall pipe be dropped or dumped into the trench. The Contractor shall not lay any pipe into the trench until the bedding and condition of the trench has been approve by the Engineer. The trench shall be free of water and maintained in that condition until the pipe has been laid and the joints have been competed.

B. Inspection of Pipe:
The pipe shall be inspected for defects prior to lowering into trench. Any defective or unsound pipe shall be removed and replaced.

C. Pipe Kept Clean:
All foreign matter or dirt shall be removed from the interior of pipe before lowering into trench. Pipe shall be kept clean by means approved by the Engineer during and after laying.

3.6 BEDDING AND HAUNCHING FOR PVC SEWER PIPE

PVC sewer pipe shall have a minimum cover of 4'. As a minimum bedding and haunching shall conform to the following:

TABLE II
MINIMUM BEDDING AND HAUNCHING

Bedding and Haunching Material	Method of Compaction for Bedding & Haunching	Height of Cover (Feet)								
		4	6	8	10	12	14	16	18	20

Crushed Stone To Spring Line of Pipe 3/4" to 1/16" Graded in Accord. With Size #67 or 68 AASHTO M43 or ASTM D448.	Crushed Rock Compacted with a Vibratory Plate Tamper-Bedding to Start a Min. of 4" Below Pipe.									
Sand to Spring Line of Pipe Passing 7/8" - 100%, Passing No. 4 - 80% Clay Lumps Not to Exceed 20% P.I. NP-10 Max.	Sand Compacted with A Vibratory Plate Tamper. Bedding to Start a Min. of 4" Below Pipe									
Excavated Material Used for Haunching P.I. NP-15 Max. L.L. Max. 35 Passing 200< 50%	Excavated Material Hand Tamped to Spring Line of Pipe Bottom of Ditch Shaped to Provide 90°<) of Contact									

Note: Bedding is material from the bottom of the pipe to the bottom of the trench. Haunching is material from the bottom of the pipe to the spring line of the pipe.

3.7 LAYING PIPE

A. Unless otherwise authorized by the Engineer, the laying of pipe on the prepared bedding shall be started at the outlet end with the spigot end pointing downstream and shall proceed toward the inlet end with the abutting sections properly matched, true to the required lines and grades. The pipe shall be fitted and matched so that when laid on the bed it shall form a smooth uniform conduit.

3.8 JOINTING POYVINYL CHLORIDE PIPE

A. The bell and spigot mating surfaces shall be wiped free of dirt or other foreign matter. A lubricant recommended by the coupling manufacturer shall be applied to the bell and spigot mating surfaces just before they are joined together. The spigot end shall then be centered on grade into the bell end of the pipe previously laid and shall be shoved home to compress the joint and to assure a tight fit between the inner surfaces. When the pipe being thusly installed, bell holes shall be excavated in the bedding material. When the joint has been made, the bell hole shall be carefully filled with bedding material to provide for adequate support of the pipe.

3.9 STOPPERS OR BULKHEADS

A. The Contractor shall furnish and install suitable stoppers at the dead end of all pipes, wyes, tees, etc. Stoppers shall be water tight. At the end of each day or when temporary stopping of construction for more than 4 hours, a tight fitting bulkhead shall be placed across the open end of all pipe. Bulkheads do not need to be water tight.

3.10 TESTING COMPLETED SANITARY SEWER LINES

A. Contractor Testing:

The Contractor shall provide all equipment, materials, (including water, if required) and do all work necessary to conduct the following tests:

a. Test for the deflection of flexible pipe.
b. Test for infiltration when pipe is below the ground water table.
c. Test for exfiltration or air testing when pipe is above the ground water table.

The tests shall be accomplished by the Contractor in the presence of the Engineer's or Owner's authorized representative. Tests results shall be signed by the Contractor's authorized representative who accomplished the testing and the Engineer's or Owner's authorized representative who witnessed the testing. Before final payment will be made to the Contractor 3 copies of all test results shall be furnished to the Engineer.

B. Deflection Testing:

a. General:
Deflection tests shall be performed on all flexible pipes. For pipelines with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection. For pipe lines with an inside diameter 27 inches and greater, a method approved by the Engineer shall be used to test for vertical deflections. Other methods shall provide a precision of 0.2% deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5.0%. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices.

b. Mandrel Sizing:
The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, all dimensions shall be per appropriate standard. Statistical or other 'tolerance packages' shall not be considered in mandrel sizing.

c. Mandrel Design:
The rigid mandrel shall be constructed of a metal or a 'rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.

d. Method Options:
Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. A deflectometer may be approved for use on a case-by-case basis. Mandrels with removable legs or runners may be accepted on a case-by-case basis.

3.11 TELEVISING THE LINE

A. The Owner or the City reserves the right to "televise" the entire length of gravity sewer line installed to insure that the line is clear of debris and free from visible defects, loose joints, improperly seated gaskets, or excessive deviations from grade. Excessive deviation from grade will be judged during this inspection as any misalignment which causes water to stand two (2) inches deep or more at any point inside the pipe. If repairs are required, affected areas shall be retelevised at Contractor's expense to determine final acceptability.

3.12 INFILTRATION OR EXFILTRATION TESTS

A. When pipes are installed below the ground water level an infiltration test shall be used in lieu of the exfiltration test. The total exfiltration as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole. For pipes installed with a horizontal curvature the exfiltration shall not exceed 10 gallons per inch diameter of pipe per mile for 24 hours. The total infiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing ground water level, whichever is greater. For construction within the 25-year flood plain, the infiltration or exfiltration shall not exceed ten gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, remedial action shall be undertaken in order to reduce the infiltration or exfiltration to an amount within the limits specified.

3.13 LOW PRESSURE AIR TEST

A. The procedure for the low pressure air test shall conform to the procedures described in ASTM C-828, ASTM C-924, ASTM F-1417 or other appropriate procedures, except for testing times. The test times shall be as outlined in this section. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply unless the pipe is to be joint tested. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by ground water above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

ALLOWABLE TIME FORMULA

$$\text{Time (Seconds)} = \frac{0.085\ (D)\ (K)(Q)}{}$$

T = time for pressure to drop 1.0 pound per square inch gauge in seconds
K = 0.000419(D)(L) **but not less than 1.0**
D = average inside diameter of pipe (inches)
L = length of line of same pipe size being tested, in feet
Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used

Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

Pipe Diameter (inches)	Minimum Time (seconds)	Length for Minimum Time (feet)	Time for Longer Length (seconds)
6	340	398	0.855(L)
8	454	298	1.520(L)
10	567	239	2.374(L)
12	680	199	3.419(L)
15	850	159	5.342(L)
18	1020	133	7.693(L)
21	1190	114	10.471(L)
24	1360	100	13.676(L)
27	1530	88	17.309(L)
30	1700	80	21.369(L)
33	1870	72	25.856(L)

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined in this subparagraph or until failure. Lines with a 27-inch average inside diameter and larger may be air tested at each joint. Pipe greater than 36-inch diameter must be tested for leakage at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by ground water above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be ten seconds.

END OF SECTION 33 05 05.11

DUCTILE-IRON UTILITY PIPE & FITTINGS
SECTION 33 05 19

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary for furnishing all ductile iron pipe and fittings required to complete the potable water lines. This specification is a design specification and the performance of the completed work is the responsibility of the Contractor.

PART 2 – PRODUCTS

2.1 DUCTILE IRON PIPE

A. General:
All ductile pipe shall conform to A.N.S.I. A21.50

2.2 LINING

A. The interior of the pipe and fittings shall be lined with enameled cement mortar, standard thickness (epoxy coated) as specified in A.N.S.I. A21.4-85/AWWA C-104.

2.3 PIPE

A. Pipe shall have a minimum thickness as follows:

6" Diameter	0.25 inch	(Class 350)
8" Diameter	0.27 inch	(Class 350)
10" Diameter	0.29 inch	(Class 350)
12" Diameter	0.31 inch	(Class 350)
14" Diameter	0.33 inch	(Class 300)
16" Diameter	0.34 inch	(Class 300)
18" Diameter	0.35 inch	(Class 300)
20" Diameter	0.36 inch	(Class 300)
24" Diameter	0.38 inch	(Class 250)

3.1 FITTINGS

A. General:
Fittings shall be either cast iron or ductile iron and shall conform to A.N.S.I. A21.10 and A.W.W.A. C-110 and C-153, Latest Edition.
B. Cast Iron Fittings:
a. 6" thru 12": Pressure Class 250 and Iron Strength Class 25.
b. 14": Pressure Class 150 and Iron Strength Class 25.
c. 16" thru 24": Pressure Class 150 and Iron Strength Class 30.
C. Ductile Iron Fittings:
a. 6" thru 24": Pressure Class 350.

3.2 JOINTS
A. General:
Joints for fittings shall be mechanical joint. Joints for pipe shall be push on joints.
B. Mechanical Joints:
Joints shall conform to A.N.S.I A21.11. Mechanical joints shall be furnished complete with joint material, rubber, bolts, nuts, glands, and gaskets. Gaskets material shall be synthetic rubber, odor free and containing no natural rubber.

C. Push-On Joints:
Push-on joints shall conform to A.N.S.I. A21.11. Push-on joints shall be complete with lubricant and gasket material. Gasket material shall be synthetic rubber, odor free and containing no natural rubber.

D. Certification:
The manufacturer shall furnish a copy of the manufacturer's affidavit of compliance with specifications and a certified copy of an analysis of the material in each gasket showing the type of synthetic rubber and that no natural rubber is present. Certification shall accompany each order delivered.

3.3 EXTERIOR COATING

A. Pipe and fittings shall have a bituminous coating approximately 1 mil. thick. Where called for on the drawings, ductile iron pipe and fittings shall be wrapped in polyethylene. The polyethylene material shall have an 8 mil. thickness and may be either clear or black. The wrapping shall be lapped in such a manner that all surfaces or pipe and fittings shall have a minimum 6" lap.

END OF SECTION 33 05 19

POLYVINYL CHLORIDE PIPE AND FITTINGS (C900 & C905)
SECTION 33 05 31.16

PART 1 – DESCRIPTION

1.1 SCOPE

A. This specification shall govern for all work necessary for furnishing all polyvinyl chloride pipe required to complete the project . This specification is a design specification and the performance of the completed work is the responsibility of the Contractor.

PART 2 – PRODUCTS

2.1 4" THRU 12" P.V.C. PIPE

A. General:
4" thru 12" P.V.C. pipe shall meet the requirements of AWWA C-900, "Polyvinyl Chloride Pressure Pipe 4" Thru 12" for Water". **4" through 12" Water Line Pipe shall be Class 150 and meet the requirements of DR 18.** The pipe and gaskets shall be approved by the Underwriters Laboratories, Inc. of the American Insurance Association, Factory Mutual and by the National Sanitary Foundation. Pipe shall conform to cast iron pipe outside diameters. All pipe shall be suitable for use as pressure conduit and be furnished with an integral bell containing a locked-in ring and spigot joint for the conveyance of water. Provisions must be made for expansion and contraction at each joint. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring, which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C-900. A complete set of joint material shall be furnished with each joint of pipe. The manufacturer shall furnish a copy of the manufacturer's affidavit of compliance with specifications and a certified copy of an analysis of the material in each gasket showing the type of synthetic rubber and that no natural rubber is present. Certification shall accompany each order delivered.

2.2 PIPIE STIFFNESS

A. The pipe stiffness using F/ÆY (for Class 150 and Dr. 18) shall be 435 psi.

2.3 QUICK BURST TEST

A. Randomly selected samples tested in accordance with ASTM D-1599 shall withstand, without failure, 755 psi. (at 73ºF) when applied in 60 - 70 seconds.

2.4 DROP IMPACY TEST

A. Pipe shall withstand, without failure at 73 degree F, an impact of a falling missile, Type C (per ASTM D-2444 and shall show no visible evidence of shattering or splitting) as follows:

6" and 8" - 100 FT/LB

10" and 12" - 120 FT/LB

2.5 STANDARD LAYING LENGTHS AND PHYSICAL REQUIREMENTS

A. Standard laying lengths shall be 20 feet (± 1") for 6" through 12" pipe. At least 85% of the total footage of pipe shall be furnished in standard lengths. The remaining 15% may be furnished in random lengths not less than 10 feet long. Each standard and random length of pipe shall be tested to 600 psi. for a minimum of 5 seconds. The integral bell shall be tested with the pipe.

PART 3 – EXECUTION

3.1 14" THRU 24" P.V.C. PIPE

A. General:
14" thru 24" P.V.C. pipe shall meet the requirements of AWWA C-905, "Polyvinyl Chloride Water Transmission Pipe 14" Thru 36". **14" through 24' Water Line Pipe shall be Class 165 and meet the requirements of DR 25.** The pipe and gaskets shall be approved by the Underwriters Laboratories, Inc. of the American Insurance Association, Factory Mutual and by the National Sanitation Foundation. Pipe shall conform to cast iron pipe outside diameters. All pipe shall be suitable for use as pressure conduit and be furnished with an integral bell containing a bonded-in, solid ring and spigot joint for the conveyance of water. Provisions must be made for expansion and contraction at each joint. The bell shall consist of an integral wall section with a bonded-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477.

The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of C-905. A complete set of joint material shall be furnished with each joint of pipe. The manufacturer shall furnish a copy of the manufacturer's affidavit of compliance with specifications and a certified copy of an analysis of the material in each gasket showing the type of synthetic rubber and that no natural rubber is present. Certification shall accompany each order delivered.

3.2 STANDARD LAYING LENGTHS AND PHYSICAL REQUIREMENTS

A. Standard laying lengths shall be 20 feet (± 1") for all sizes. At least 85% of the total footage of pipe shall be furnished in standard lengths. The remaining 15% may be furnished in random lengths not less than 10 feet long. Each standard and random length of pipe shall be tested to 330 psi. for a minimum of 5 seconds. The integral bell shall be tested with the pipe.

3.3 FITTINGS

A. All fittings 6" and larger as listed in A.W.W.A. specification C-110 and C-153 shall be compact ductile iron and in accordance with A.W.W.A. Specifications C-104, C-110, C-111, and C-153, latest editions.

3.4 CAST IRON FITTINGS

A. 6" thru 12": Pressure Class 250 and Iron Strength Class 25.
B. 14": Pressure Class 150 and Iron Strength Class 25.
C. 16" thru 24": Pressure Class 150 and Iron Strength Class 30.

3.5 DUCTILE IRON FITTINGS

A. 6" thru 24": Pressure Class 350.

3.6 JOINTS

A. Fittings shall be furnished with mechanical joints.

3.7 WRAPPING FITTINGS

A. All fittings shall be wrapped with polyethylene in accordance with A.W.W.A. Specification C-105, latest edition.

3.8 MARKING

A. Each length of pipe shall be marked to indicate Pressure Class, DR, UL and AWWA C-900 approval.

END OF SECTION 33 05 31.16

POLYVINYL CHLORIDE PIPE AND FITTINGS (SCH. 40) FOR DUCT
SECTION 33 05 31.29

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary for furnishing polyvinyl chloride pipe and fittings required to complete water lines 2” diameter and less. This specification is a design specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 FITTINGS

A. All Fittings shall be Schedule 40 PVC fittings.

2.2 PIPING

A. All Piping shall be Schedule 40 PVC pressure pipe with bell ends.

PART 3 – EXECUTION

3.1 SCHEDULE 40 PVC PRESSURE PIPE

A. Pipe and fittings shall be manufactured from PVC 1120 which is a Type 1, Grade 1, polyvinyl chloride compound having a design stress rating of 2000 psi at 73° F and conforms to ASTM D-1784. Physical dimensions and tolerances of PVC pipe shall conform to and ASTM D-1785 for Schedule 40. Pipe shall be marked in accordance with ASTM D-2241, i.e., nominal pipe size, type of PVC, schedule, pressure rating, ASTM designation number, manufacturer's name and code and the National Sanitation Foundation Seal.

3.2 PVC PIPE COUPLINGS AND JOINTS

A. Schedule 40 PVC:
Couplings shall be Schedule 40, Solvent Weld and shall conform to ASTM D-2466.

3.3 PVC FITTINGS

A. Schedule 40 PVC:
Fitting shall be PVC, shall be solvent weld, and shall conform to ASTM D-2466.

END OF SECTION 33 05 31.29

SANITARY SEWER MANHOLES
(FIBERGLASS)
SECTION 33 05 76

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to construct all sanitary sewer manholes (fiberglass) required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 DIAMETER

A. Manholes shall have an inside diameter of either 48" or 1.5 times the nominal pipe diameter of the largest pipe, whichever gives the larger diameter. A concentric manway reducer over the straight wall section shall have an inside diameter of 23".

2.2 WALL THICKNESS

A. The minimum wall thickness of the fiberglass manholes shall be 1/2".

2.3 CONCRETE

A. Concrete shall have a minimum compressive strength of 3000 p.s.i. at 28 days and shall be in accordance with Subsection 03 30 02 Normal Weight Aggregate Concrete.

2.4 REINFORCING STEEL

A. Reinforcing steel shall be new billet steel conforming to ASTM A-615. Also see Section 03 20 01 Concrete Reinforcement.

2.5 FIBERGLASS STRUCTURE

A. Fiberglass manholes shall be in accordance with ASTM D-3753 "Glass Fiber-Reinforced Polyester Manholes". Manholes shall be a one-piece unit manufactured by Owens/Corning or approved equal.

2.6 SEALS

A. Manholes pipe seals shall be made of corrosion resistant plastic. It shall eliminate leaks ground pipe entering manhole wall and shall permit pipe movement without loss of seal integrity. Pipe seals (waterstops) shall be as manufactured by Fernco of Davidson, Michigan, or approved equal. Caulk for interior seal between fiberglass manhole and concrete base shall be Epo-Flex epoxy (gun grade consistency) as manufactured by Dewey Supply of Corpus Christi, or approved equal. Caulk for exterior seal between fiberglass manhole and concrete shall be Ram-Nek flexible plastic gasket material as manufactured by K. T. Snyder Company of Houston, or approved equal.

2.7 MANHOLE RING AND COVER

A. Manhole rings and covers shall be the round, roadway type, with solid cover and bottom flange. They shall be grey iron castings boldly filleted at angles and the arises shall be sharp and perfect. The castings shall be true to pattern, form and dimensions, free from cracks, sponginess, blow holes or other pouring faults affecting their strength and value for the service intended. Surfaces of the castings shall be free from burnt-on sand and shall be reasonably smooth. Runners, risers, fins and other cast-on pieces shall be removed from the surfaces. Provide 22-1/2" inside diameter x 5 inch high flange. Manhole ring and cover shall be designed for H-20 loading with machined joints (but for ring and covers in Texas Dept. of Highways R. O. W., cover must weigh 175 lbs.).

2.8 DEFECTS NOT PERMITTED IN FIBERGLASS STRUCTURE

A. Interior Surfaces:
   a. Crazing
   b. Delamination
   c. Exposed fibers
   d. Blisters over 1/2 inch in diameter
   e. Pits and voids directly under surface that can be broken by finger pressure, over 5 per square foot
   f. Wrinkles over 1/8 inch

B. Exterior Surfaces:
   a. Delamination
   b. Exposed fibers
   c. Blisters over 1/2 inch in diameter
   d. Sharp projections; the surface shall be relatively smooth as to allow handling of manholes without the need for gloves or special protection.

2.9 REPAIRS TO FIBERGLASS STRUCTURE

A. Repairs shall not be permitted unless the required manhole meets all requirements of an undamaged manhole and its components.

2.10 MARKING AND IDENTIFICATION OF FIBERGLASS STRUCTURES

A. All manholes shall be marked on the inside. The markings shall be permanent and include:
   a. Manufacturer Identification (Name)
   b. Manufacturing Serial No. (Number to appear in report for identification)

PART 3 – EXECUTION

3.1 EXCAVATION: See Subsection 31 23 00

3.2 TRENCH EXCAVATION SAFTEY: See Subsection 31 23 00.

3.3 MANHOLE PREPARATION

A. Cutout shall be equal to the outside diameter of pipe to pass through it, plus 1/2 inch. Cuts are to be made using electric or gasoline-powered circular saw with masonry blade. Do not use axe or other impact-type tools.

3.4 HANDLING

A. Do not drop or impact the manholes. Manholes shall be chocked if stored horizontally. If manholes must be moved by rolling, the ground traversed shall be smooth and free of rocks, debris, etc. When lifting manholes in horizontal position, use two slings with spreader bar. For lifting in vertical position, 3 lift lugs may be provided (recommended by manufacturer) at top of manhole. Only a pliable strap or rope should contact manhole; do not use chains or steel cables.

3.5 HEIGHT ADJUSTMENT

A. If necessary, position bricks or blocks in excavation to adjust manholes to correct elevation.

3.6 CONCRETE

A. Pour concrete in excavation to depth specified on Drawings. Concrete shall extend at least 4" above all brick or block height adjustments.

3.7 INSTALLATION

A. Lower manhole into wet concrete until it rests at proper elevation, and a minimum of 6" into concrete; then move manhole to plumb.

3.8 BACKFILL MATERIAL: See Subsection 31 23 00 Structural Excavation and Backfill.

3.9 SCHEDULE OF BACKFILLING: See Subsection 31 23 00 Structural Excavation and Backfill.

3.10 BACKFILL: See Subsection 31 23 00 Structural Excavation and Backfill.

3.11 TESTING FOR LEAKAGE

A. Manholes shall be tested for leakage separately and independently of the wastewater lines by hydrostatic exfiltration testing, vacuum testing, or other methods acceptable to the TNRCC. If a manhole fails a leakage test, the manhole must be made water tight and retested. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour. Alternative test methods must ensure compliance with the above allowable leakage. Hydrostatic exfiltration testing shall be performed as follows: All wastewater lines coming into the manhole shall be sealed with an internal pipe plug, then the manhole shall be filled with water and maintained full for at least one hour. The Contractor shall provide water, labor and materials for testing.

3.12 CERTIFICATION

A. The Contractor shall submit a written certification before acceptance. This shall consist of a copy of manufacturer's test report or a statement by the supplier, accompanied by a copy of the test results, that the man- hole has been sampled, tested and inspected in accordance with the provisions of ASTM D-3753 and meets all requirements. Each certification so furnished shall be signed by an authorized agent of the supplier or manufacturer.

3.13 MARKING AND IDENTIFICATION

A. Each manhole shall be marked with the following information:
   a. Manufacturer's name or trademark
   b. Manufacturing special number
   c. Total length and nominal diameter

END OF SECTION 33 05 76

GATE VALVES
SECTION 33 14 19

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary to furnish and install the gate valves with box and cover as required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions" Art. SC-1 Definitions.

PART 2 – PRODUCTS

2.1 GENERAL

A. All valves shall comply with the latest requirements of applicable A.W.W.A. Specifications. All valves shall open in a counter-clockwise direction. Valves to provide an unobstructed waterway of a diameter of a circle not less than the full nominal diameter of the valve when the gate is open. All valves shall be installed vertically unless shown specifically otherwise on the drawings.

PART 3 – EXECUTION

3.1 VALVES LESS THAN 4-INCHES

A. Valves shall be bronze body gate valves designed for a minimum 200 p.s.i. water working pressure service. Valve bodies shall be cast bronze that conforms to A.S.T.M. B-62, Grade 1. Valves shall be of an acceptable manufacture and shall conform to A.W.W.A. C-500, Type 1. Gate valves shall have a rising stem and NPT threaded ends. Gate valves and shall be equipped with handwheels. If valve is installed underground, provide a valve box and if necessary an extension so that valve can be operated from ground level.

3.2 VALVES 4-INCHES THROUGH 12-INCHES

A. General
Valves shall be resilient-seated gate valves, Waterous Series 500 wedge valve or Clow F6100 resilient-seated valve. Resilient-seated valves shall conform to A.W.W.A. C-509, latest edition and be as follows:
   a. The valve body, bonnet and gate castings shall be ductile iron.
   b. The resilient-seated gate valves shall have non-rising stems.
   c. Valve ends shall be mechanical joint type. A complete set of joint materials shall be furnished with each valve.
   d. Stem seals shall be the O-ring type.
   e. Valves shall open left (counter clockwise).
   f. Tapping valves to be used with tapping saddles shall have one end mechanical joint.

B. Protective Coatings
   a. Interior Of Valve:
      (1) Body And Bonnet: Factory applied epoxy coating conforming to A.W.W.A. C550.
      (2) Gate: Factory applied rubber encapsulated conforming to A.W.W.A. C509.
   b. Exterior Of Valve: Factory applied epoxy coating conforming to A.W.W.A. C550.

C. Valve Ends
Gate valves shall be furnished with mechanical joint ends. Mechanical joints shall conform to A.N.S.I./A.W.W.A. C111/A21.11.

D. Valve Boxes
Gate valves shall be furnished with wrench nut, an extension to within 6" of top of valve box and cast iron valve box. Valve box shall be an adjustable road type valve box with a minimum opening of 5-inches. Valve box shall be cast iron and shall be complete with base, extension, top section and cover. The base shall be of proper size to fit the valves on which the base is installed. Valve boxes shall be 461S Tyler Or Western U.SA. made.

3.3 SUBMITTAL DATA

A. The manufacture shall upon request furnish two (2) certified sets of prints showing complete details, dimensions and materials used. The manufacturer shall also upon request furnish a certified letter of compliance stating that their valve meets these specifications. Also, the manufacturer shall upon request furnish one (1) certified copy of the physical tests of all metals used in the manufacture of the valve.

END OF SECTION 33 14 19

FIRE HYDRANTS
33 14 19.13

PART 1 – GENERAL

1.1 SCOPE

This specification shall govern for all work necessary to provide all fire hydrants required to complete the project. This specification is a performance specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions" Art. SC-1 Definitions.

PART – PRODUCTS

2.1 CONCRETE

A. Concrete shall have a minimum compressive strength of 2000 p.s.i. at 28 days.

2.2 FIRE HYDRANTS

A. Fire hydrants shall conform to A.W.W.A. C-502, latest revision thereof, unless specified otherwise herein. Hydrants shall be of the traffic model type equipped with a safety flange or collar on both the hydrant barrel and stem. Fire Hydrants shall be Waterous Pacer 100 Type.
B. Type of Shutoff: The shut off shall be of the compression type only.
C. Inlet Connection:
The inlet shall be AWWA C-111 latest revision, mechanical joint for six (6") inch, Class 50 ductile iron pipe. A complete set of joint material shall be furnished with each hydrant.
D. Delivery Classifications:
Each hydrant shall have two hose nozzles and one pumper nozzle. Nozzle shall be threaded into the hydrant.
E. Bury Length:
The hydrants shall be furnished in the bury length of 42” unless otherwise noted on the drawings.
F. Diameter (Nominal Inside) of Hose and Pumper Nozzles:
The hose nozzles shall be two and one-half (2-1/2") inches inside diameter and the pumper nozzle shall be four (4") inches inside diameter.
G. Hose and Pumper Nozzle Threads:
The hose nozzles shall have two and one-half (2-1/2) inch National Standard Thread (7-1/2 threads per inch). The pumper nozzle shall have six (6) threads per inch with an outside diameter of 4.658 inches, pitch diameter of 4.543 inches, and a root diameter of 4.406 inches.
H. Harnessing Lugs: None required.
I. Nozzle Cap Gaskets: Required.
J. Drain Opening:
Drain opening is required. Tapping of the drain opening for pipe threads is not required.
K. The Valve Seat Ring:
The valve seat ring shall not be made an integral part of the shoe. The valve seat ring shall be bronze and shall thread into a bronze drain ring.
L. Nozzle Cap Chains: Hydrants shall be furnished with nozzle cap chains.
M. Direction to Open: The hydrants shall open left (counter clockwise).
N. Coating:
Fire Hydrants shall be epoxy coated and the portion of the hydrant above the ground line shall be coated the color selected by the Owner.

O. Shape and Size of Operating and Cap Nuts:
The operating and cap nuts shall be tapered pentagon one and one-fourth (1-1/4") inch point to face at base and one and one-eight (1-1/8") inch point to face at top of nut.

P. Size of Fire Hydrant:
The main valve opening shall not be less than five and one-fourth (5-1/4") inches inside diameter.

Q. Valve Facing:
The main valve facing of the hydrant shall be rubber with 90± one (1) durometer hardness. When the main valve lower washer and stem nut are not an integral casting then the bottom stem threads shall be protected with ductile and/or bronze cap nut and a stainless steel and/or bronze lock nut.

R. Barrel Sections:
The hydrant shall be made in two or more barrel sections with flanges connecting the barrel to the elbow and to the packing plate.

S. Breakable Coupling:
Hydrants shall be equipped with a breakable coupling on both the barrel section and the stem. The couplings shall be so designed that in case of traffic collision, the barrel and stem collar will break before any other part of the hydrant breaks. These couplings shall be at least two (2) inches above the finished grade line.

T. Hydrant Adjustment:
The hydrant shall be designed as to permit its extension without excavating after the hydrant is completely installed.

U. Breakable Collars, Barrel and Stem:
Weakened steel or weakened cast iron bolts that are used in the breakable barrel couplings will not be acceptable.

V. Operating Stem:
Stems that have operating threads located in the waterway shall be made of manganese bronze, everdure, or other high quality non-corrodible metal. Stems that do not have operating threads located in the waterway must be sealed by a packing gland or "O" ring seal located between the stem threads and the waterway. Iron or steel stems shall be constructed with a bronze sleeve extending through the packing "O" ring seal area. The sleeve shall be of sufficient length to be in the packing or "O" ring seal in both open and closed positions of the main valve. The sleeve shall be secured to the steel stem so as to prevent water leakage between the two when subjected to 300 pounds hydrostatic test pressure.

W. Drain Valve Mechanism:
Drain valves operating through springs or gravity are not acceptable.

X. Operating Stem Nut:
The operating stem nut shall be designed to prevent seepage, rain, or sleet and the accumulation of dust between the operating nut and the hydrant top. The operating stem nut shall be made of bronze.

Y. Packing Gland or "O" Ring Seal:
Fire hydrants having the threaded part of the stem at the hydrant top shall be equipped with a packing gland or an "O" ring seal immediately below the threaded section of the stem.

PART – 3 EXECUTION

3.1 GENERAL:

Fire hydrants shall be located in accordance with the details shown on the drawings. Fire hydrants shall stand plumb and hose nozzle shall be parallel to curb and street with the pumper nozzle facing the street.

3.2 CONNECTION TO MAIN:

Each hydrant shall be connected to the main with a six (6") inch branch line controlled by an independent six (6") inch gate valve (see 2G8). All pipe from the main tee to the fire hydrant shall be 6 inch DR 18 PVC (C900) pipe (see 2G1). Anchor fittings shall be used to connect the fire hydrant gate valve to the water main.

3.3 THRUST RESTRAINT:

The bowl of each hydrant shall be securely braced against undisturbed earth at the end of the trench with a 3” x 12” x 5’-0” wolmanized timber and all pipe, fitting and hydrant joints shall be provided with retainer glands.

3.4 DRAINGE PIT:

A drainage pit shall be excavated below each hydrant and filled with 1/2 cubic yard of river rock gravel, under and around the bowl of the hydrant and to a level 6-inches above the waste opening. No hydrant drainage pit shall be connected to a sewer.

3.5 CONCRETE PAD:

The fire hydrant shall be installed on a 3” x 20” x 20” concrete pad.

3.6 POLYETHYLENE WRAP:

The barrel and base of the fire hydrant shall be wrapped in 8 mil polyethylene.

3.7 WASHING AND STERILIZING FITTINGS:

Valves, hydrants and fittings shall be stored on timbers and kept clean. Where soil or other substances have come in contact with the water surfaces of the fittings, the interior shall be washed and sterilized with an approved sterilizing agent.

3.8 CERTIFICATION:

The manufacturer shall upon request furnish two (2) certified sets of prints showing complete details and dimensions of the hydrant. The manufacturer shall upon request furnish one (1) certified copy of the physical tests of all metals used in the manufacture of the fire hydrant that is normally manufactured and that will meet these specifications. The manufacturer shall upon request furnish a certified letter of compliance stating that their fire hydrant meets these specifications.

END OF SECTION 33 14 19.13

POLYVINYL CHLORIDE PIPE AND FITTINGS FOR SEWER LINES (SDR 26)
SECTION 33 31 11

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification shall govern for all work necessary for furnishing all polyvinyl chloride pipe and fittings required to complete the PVC sewer pipe for site utilities. This specification is a design specification as defined in Section 00 72 00 General Conditions, Subsection "Supplemental General Conditions", Art. SC-1 Definitions.

PART 2 – PRODUCTS (NOT APPICABLE)

PART 3 – EXECUTION

3.1 MATERIAL

A. Pipe and fittings shall be manufactured from clean, virgin, Type I, Grade I polyvinyl chloride compound, conforming to ASTM Specification D-1784.

3.2 PIPE

A. 4" Thru 15" Diameter Pipe: Pipe shall be **SDR 26** and conform to ASTM Specification D3034.

3.3 PIPE STIFFNESS

A. Minimum pipe stiffness at 5% deflection shall be in accordance with the schedule shown below

Pipe Diameter	Pipe Stiffness	
Inches	kPa	p.s.i.
4	790	115
6 Thru 15	790	115

Minimum pipe stiffness at 5% deflection shall be calculated in accordance with ASTM Specification D-2411.

3.4 FITTINGS

A. Fittings and accessories shall be manufactured of the same material as specified for pipe, shall be at least **SDR 26** and shall have joint configurations identical to that of the pipe.

3.5 JOINTS

A. Joints for pipe and fittings shall be compression rubber gasket joints conforming to the material and performance of ASTM Specification D-3212. The pipe joint shall consist of a bell that is an integral part of the pipe wall with compression rubber rings. The joint shall be capable of withstanding an internal hydrostatic pressure of 25 p.s.i. for one (1) hour without any leakage.

3.5 MARKING

A. Pipe shall be marked to show nominal pipe size, type of PVC, SDR number, ASTM designated number and manufacturer's name and code.

END OF SECTION 33 31 11