CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

Renovation of the Bryan City Hall Annex

CITY JOB NO. 700-ME-0102

RFB # ENG 10-13

CITY OF BRYAN

The Good Life, Texas Style.™

PREPARED BY:

CITY OF BRYAN
ENGINEERING DEPARTMENT

April 2010

CONTRACT DOCUMENTS AND SPECIFICATIONS
FOR

RENOVATION OF THE BRYAN CITY HALL ANNEX
CITY JOB NO. 700-ME-0102
RFB # ENG 10-13

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STATE OF TEXAS
BRIAN W. BRUMMIT
74740
LICENSED
PROFESSIONAL ENGINEER
4/5/10

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STATE OF TEXAS
HAROLD B. KUHN
50687
LICENSED
PROFESSIONAL ENGINEER
4/5/10

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DISCLOSURE REQUIREMENTS

Chapter 176 of the Texas Local Government Code mandates the public disclosure of certain information concerning persons doing business or seeking to do business with the City of Bryan, including affiliations and business and financial relationships such persons may have with City of Bryan officers. An explanation of the requirements of Chapter 176, applicable forms and a complete text of the new law are available at:

http://www.bryantx.gov/departments/index.html?name=texas_ethics

If you are unable to obtain such information online, please contact the City of Bryan Engineering Department, 300 S. Texas Ave., Bryan, Texas 77803 or call (979)209-5030.

BY DOING BUSINESS OR SEEKING TO DO BUSINESS WITH THE CITY OF BRYAN, YOU ACKNOWLEDGE THAT YOU HAVE BEEN NOTIFIED OF THE REQUIREMENTS OF CHAPTER 176 OF THE TEXAS LOCAL GOVERNMENT CODE AND THAT YOU ARE SOLELY RESPONSIBLE FOR COMPLYING WITH THEM.

REQUEST FOR BIDS

Sealed bids will be received by the City of Bryan at the Engineering Department Office until April 21, 2010 publicly opened and read aloud at 2:00 p.m. CDT, same date, on the following commodities or services:

RENOVATION OF THE BRYAN CITY HALL ANNEX
City Job No.: 700-ME-0102
Bid Number:ENG 10-13

The Work consists of renovations to the interior of the existing building (Formerly the City of Bryan Police Offices), including new walls, doors, ceilings, mechanical systems and electrical systems. It also includes replacing the existing windows with new metal stud walls with plaster finish and new aluminum storefront windows. New concrete ramps are also included in the scope of work.

A pre-bid conference is scheduled at 10:00 a.m., April 12, 2010, at the Engineering Department Conference Room at 300 S. Texas Ave., Bryan, Texas.

Bid forms, specifications and drawings may be secured at the Engineering Department Office at 300 S. Texas Ave., Bryan, Texas 77803. These documents are available online at ***http://brazosbid.cstx.gov/***. These documents are also available on CDROM for no charge. Cost for the printed documents will be two hundred dollars ($200.00). The check for Plans, Specifications and Information for Bidders shall be made payable to the City of Bryan.

The City of Bryan reserves the right to accept or reject any or all bids, to waive any informalities and technicalities, to accept the offer considered most advantageous and to award the bid to the vendor offering the best value to the City of Bryan. Additionally all bidders are hereby notified that the City of Bryan shall consider all factors it believes to be relevant in the determination of the best value including, but not limited to, the proximity of the bidder as it relates to their ability to perform the contract for the City of Bryan.

WEB POST DATE : April 6, 2010

SCHEDULE OF EVENTS

- April 6, 2010 – Web site post date.
- April 12, 2010 @ 10:00 a.m. C.D.T.- Pre-bid meeting to be held in the Engineering Office, 300 S. Texas Ave., Bryan, TX.
- April 14, 2010 @ 10:00 a.m. C.D.T. - Deadline for written requests for clarifications to the RFB.
- April 16, 2010 – Deadline to Issue Final Addendum
- April 21, 2010 @ 2:00 p.m. C.D.T – Sealed bids delivered to the Office of the Engineering Department, City of Bryan, 300 S. Texas Ave., Bryan, TX. Bids received after the time and date set for the opening of the bid will not be accepted and will be returned unopened.
- May 11, 2010 Anticipated date of award
- The Notice to Proceed will be issued within 45 days after the Contract has been awarded.

PROJECT SCOPE

Renovation of the Bryan City Hall Annex
City Job No.: 700-ME-0102

This project consists of the following:

Renovations to the interior of the existing building (Formerly the City of Bryan Police Office), including new walls, doors, ceilings, mechanical systems and electrical systems. It also includes replacing the existing windows with new metal stud walls with plaster finish and new aluminum storefront windows. New concrete ramps are also included in the scope of work.

BID PROPOSAL INSTRUCTIONS

(Proposal)

The following items must be included with the bid when it is submitted. The City reserves the right to reject any bid for failure to comply with these requirements.

The bid documents (Proposal Pages) may be removed from the specification booklet and submitted with a bid bond or cashier's check. It is not necessary to include copies of the addendums. A space to acknowledge receipt of addendums is included in the bid documents.

- An **executed Bidder's Bond** or Cashier's Check for an amount equal to 5% of the greatest amount of the bid. The bidder's original corporate seal must be affixed to the bid bond, or a resolution from the corporation's directors must accompany the bond that authorizes an individual to sign the bid proposal on behalf of the corporation.
- A **bid proposal** that has been fully completed and signed by the person authorized to represent the company submitting the bid. The proposal must use the same form or a photocopy of the form provided in the bid document. Acknowledgment of the receipt of any and all addenda to the bids must be provided on the proposal.
- If the bidder is a corporation, a copy of their **"Franchise Tax Certificate of Account Status"** showing all franchise taxes are current.
- A completed **"Statement of Bidder's Qualifications**" (this item may be submitted to the City within 3 working days of the bid opening for the proposal to be considered.
- All bidders must submit with their bid the "**Felony Conviction Notification form"** contained within this bid package. Failure to acknowledge and submit the completed Felony Conviction Notification form is sufficient cause for the bid to be rejected.

Additional information regarding these items is provided in the Proposal Pages that follow.

Bidders on this work will be required to comply with the President's Executive Order No. 11246 regarding non-discrimination in employment. The requirement for bidders and contractors under this order are available at the City of Bryan Engineering Department.

In order to ensure a fair and public bid process, all questions related to this Request for Bid shall be addressed in writing via the ***Brazos Valley Online Bidding System (http://brazosbid.cstx.gov/)****.* ***Questions shall be submitted in writing to Nikki Martin, nmartin@bryantx.gov prior to 10:00 a.m. CDT on April 14, 2010 .*** *Contact with any City of Bryan employee or official is prohibited without prior written consent from the City Engineer. Failure to observe this requirement may be grounds for rejection of the Bid.*

CITY OF BRYAN

PROPOSAL

DATE: _____

Proposal of _____

a corporation organized and existing under the laws of the State of _____;

or a partnership consisting of _____;

or an individual trading as _____:

TO THE CITY OF BRYAN
BRYAN, TEXAS

The undersigned hereby proposes to furnish all labor and material, tools, and necessary equipment, for the construction of the project, and to perform the work required for the construction of the said project, at the locations set out by the plans and specifications, in strict accordance with the contract documents.

The undersigned further agree to execute a contract within 5 business days from the date of notice of intent to award this proposal, or within such time as the City of Bryan may determine, and in case the undersigned fails or neglects to appear to execute the contract within the specified time, of which this proposal, the plans, specifications, special provisions and advertisements are a part, the undersigned will be considered as having abandoned it, and the Cashier's Check or Bidder's Bond in the _____ sum _____ of ($ _____) Dollars accompanying this proposal will be forfeited to the City of Bryan, Texas, by reason of such failure on the part of the undersigned.

The undersigned further agree that the proposal guaranty may be retained by the City of Bryan, Texas provided the under-signed is one of the three lowest and most advantageous bidders, and that said proposal guaranty shall remain with the City of Bryan until the contract has been made by the successful bidder; otherwise, proposal guaranty may be obtained from the City Engineer after forty-eight hours from the time of opening the bids.

The undersigned certify that they are duly authorized to submit this Proposal and that this Proposal is made in good faith without collusion or connection with any other person, persons, partnership, company, firm, association or corporation offering bids on this work, and to do the work for the following bid item unit prices, their associated extended totals and sum of extended totals as listed on the following bid tabulation forms:

"RENOVATION OF THE BRYAN CITY HALL ANNEX
CITY JOB No. 700-ME-0102
Engineer's Estimate of Construction Cost
April 6, 2010"

ITEM	QTY	UNIT	ITEM DESCRIPTION	UNIT PRICE	AMOUNT
DIVISION 1 - SITE CONSTRUCTION					
			Unit Pavers		
			Division 1 -Site Construction Subtotal:	**$**	**-**
DIVISION 3 - CONCRETE					
			Concrete ramps and sidewlks		
			Division 3 -Concrete Subtotal:	**$**	**-**
DIVISION 5 - METALS					
			Ornamental Railing		$ -
			Steel columns and beams for window supports		
			Cold-formed Metal		$ -
			Division 5- Metals Subtotal:	**$**	**-**
DIVISION 6 - WOOD AND PLASTICS					
			Rough Carpentry		$ -
			Interior Architectural Wood work		$ -
			Sheathing		$ -
			Division 6- Wood and Plastics Subtotal:	**$**	**-**
DIVISION 7 - THERMAL AND MOISTURE PROTECTION					
			Building Insulation		$ -
			Polyvinyl-chloride (PVC) Roofing		$ -
			Division 6- Wood and Plastics Subtotal:	**$**	**-**
DIVISION 8 - DOORS AND WINDOWS					
			Standard Steel Doors And Frames		$ -
			Interior Aluminum Frames		$ -
			Flush Wood Doors		$ -
			Aluminum-framed Entrances And Storefronts		$ -
			Door Hardware (scheduled By Naming Products)		$ -
			Glazing		$ -
			Mirrors		$ -
			Glazed Aluminum Curtain Walls		$ -
			Division 8- Doors and Windows Subtotal:	**$**	**-**

DIVISION 9 - FINISHES					
			Portland Cement Plaster		$ -
			Gypsum Board Assemblies		$ -
			Acoustical Panel Ceilings		$ -
			Resilient Floor Tile		$ -
			Carpet		$ -
			Painting (professional Line Products		$ -
			Ceramic Tile		$ -
					$ -
			Division 9- Finishes Subtotal:	**$**	**-**

DIVISION 10 - SPECIALTIES					
			Toilet Compartments		
			Signage		
			Fire-protection Specialties		
			Toilet And Bath Accessories		
			Division 10- Specialties Subtotal:	**$**	**-**

DIVISION 13 - SPECIAL CONSTRUCTION					
			Security Access System		
			Fire Alarm System		
			Fire Suppression Sprinklers		
			Division 13- Special Construction Subtotal:	**$**	**-**

DIVISION 14 - CONVEYING SYSTEMS					
			Hydraulic Elevator		
			Division 14- Conveying Systems Subtotal:	**$**	**-**

DIVISION 15 - MECHANICAL					
			Piping Insulation		
			Duct Insulation		
			Plumbing Piping		
			Air Cooled Water Chillers		
			Air Handling Units		
			Ducts		
			Division 15- Mechanical Subtotal:	**$**	**-**

DIVISION 16 - ELECTRICAL					
			Electrical		
			Interior Luminaires		
			Exterior Luminaires		
			Division 16- Electrical Subtotal:	**$**	**-**

FELONY CONVICTION NOTIFICATION

Any person and/or business entity that enters into a contract with the City of Bryan must give advance notice to the City if any employee or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony. The notice must also describe the role that the employee, owner, or operator will perform in executing the contract. The City may require substitution of employees in the performance of the contract.
The City may terminate a contract with a person or business entity if the City determines that the person or business entity failed to give notice as required by this clause, misrepresented the conduct resulting in the conviction, or failed to substitute personnel at City's request.

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

Vendor's Name:

_____ _____

Authorized Company Official's Name (Printed) Date

A. My firm is not owned or operated by anyone who has been convicted of a felony nor does it have any employees who have been convicted of a felony:

Signature of Company Official:

_____

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

_____ _____

_____ _____

Signature of Company Official:

_____

C. Provide a general description of the conduct resulting in the conviction of a felony.

_____

_____

_____

Signature of Company Official:

_____

D. Describe the role that the person(s) convicted of a felony will play in the performance of the contract.

_____

_____

_____

Signature of Company Official:

_____

CERTIFICATION OF BID

CERTIFICATION and AUTHORIZATION:
RFB # ENG 10-13

The undersigned certifies that he has fully read and understands this "Request for Bid" and has full knowledge of the scope, quantity, and quality of the services and materials to be furnished and intends to adhere to the provisions described herein. The undersigned also affirms that they are duly authorized to submit this Bid, that this Bid has not been prepared in collusion with any other Vendor, and that the contents of this Bid have not been communicated to any other Vendor prior to the official opening of this Bid. Additionally, the undersigned affirms that the firm is willing to sign the enclosed Exhibit A, Standard Form of Contract, if awarded the bid.

Signed By: _____ Title:_____

Typed Name: _____ Company Name:_____

Phone No.: _____ Fax No.:_____

Email: _____

Bid Address:_____

P.O. Box or Street City State Zip

Order Address:_____

P.O. Box or Street City State Zip

Remit Address:_____

P.O. Box or Street City State Zip

Federal Tax ID No.: _____

Date:_____

The undersigned hereby declares that he has visited the sites and has carefully examined the plans, specifications and contract documents relating to the work covered by his bid or bids, that he agrees to do the work, and that no representations made by the City are in any sense a warranty, but are mere estimates for the guidance of the Contractor.

Upon receipt of notice of intent to award the bid, Contractor will execute a formal contract within five (5) business days, and will deliver a Surety Bond in the amount of 100% of the total bid price for the faithful performance of this contract. The bid security attached, without endorsement, in the sum of ($_____) Dollars, is to become the property of the City of Bryan in the event the contract and bond are not executed within the time above set forth, as administrative costs for the delay and additional work caused thereby.

TIME OF COMPLETION : The undersigned agrees to complete the work within _____ _____working days from the date designated by the Notice to Proceed.

The undersigned further declares that he will provide all necessary tools, and apparatus, do all the work, and furnish all materials, and do everything required to carry out the above mentioned work covered by this proposal, in strict accordance with the contract documents, and the requirements pertaining thereto, for the sum or sums above set forth. Additionally, the undersigned affirms that the firm is willing to sign the City's Standard Form of Contract as reflected in the specifications, if awarded the contract.

Acknowledgement for Receipt of Addendums:

Addendum Number _____ Initial _____

Addendum Number _____ Initial _____

Addendum Number _____ Initial _____

Respectfully submitted,

_____
(Signature)

_____
(Address)

_____
(City, State, Zip)

NOTE: Do not detach bid from other papers. Fill in with ink and submit complete with attached papers.

STATEMENT OF BIDDER'S QUALIFICATIONS

Bidders who have not had a contract with the City of Bryan within the last five years must furnish sufficient written evidence that single bona fide contract, in excess of two-thirds of the face amount of this bid, have been successfully and satisfactorily completed on work of a similar nature. This evidence shall be furnished on the form that follows. The contractor must show job locations, type of projects, contract amounts, and dates completed. This information must also be furnished for any proposed subcontractors. Failure to submit this evidence shall be just cause for disqualification of the bid. The successful bidder, at the discretion of the City Council, may be required to furnish a complete financial statement prepared and certified to by a Certified Public Accountant.

STATEMENT OF BIDDER'S QUALIFICATIONS (Continued)

Name of Company: _____

Years in Business: _____

A. REFERENCES: List projects on which a similar type of work was performed within the past five years.

1.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

2.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

3.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

4.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

5.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

6.

Project Name:	_____	Completed Cost:	_____
Describe work:	_____		
Owner:	_____	Date Completed:	_____
Contact Person:	_____	Phone Number:	_____

STATEMENT OF BIDDER'S QUALIFICATIONS
(Continued)

B. Superintendent (field) & Project Manager (office) proposed for the project, years of experience in their position, and list of projects, which they managed.

Projects that were managed by Superintendent:

Superintendent's Name: _____ Number of Years Experience: _____

Projects

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Projects that were managed by Project Manager:

Project Manger's Name: _____ Number of Years Experience: _____

Projects

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

Project Name: _____ City/State: _____

SPECIAL PROVISIONS

RENOVATION OF THE BRYAN CITY HALL ANNEX

700-ME-0102

SPECIAL PROVISIONS-TABLE OF CONTENTS

SECTION NUMBER	DESCRIPTION
SP 1.	City Project Manager
SP 2.	Contingency
SP 3.	Design Engineer
SP 4.	Mobilization and Project Overhead
SP 5.	Digital Photo Documentation of Project
SP 6.	Solid Waste Coordination

SP 1. CITY PROJECT MANAGER:

Barney Williams
P.O. Box 1000
Bryan, TX 77805
979-209-5030

SP 2. CONTINGENCY:

The amount specified as "Contingency" shall be used for authorized changes required to complete the original scope of work. Changes shall be authorized in writing by the City prior to work being performed.

SP 3. DESIGN ARCHITECT:

The design architect for this project is The Arkitex Studio, Inc. The address of that firm is 308 North Bryan Avenue, Bryan, Texas 77803. The phone number is 979-821-2635. The project manager is Mike Record, AIA, Principal.

SP 4. MOBILIZATION AND PROJECT OVERHEAD:

The bid item "Mobilization and Project Overhead" shall include and not be limited to the following: cost to mobilize and demobilize equipment to the project site, sediment control, construction staking, the cost of bonds and insurance, and all other incidental costs associated with the project. Payment will be made on the following schedule: 25% - first month of work, 50% - upon 50% of project completion, 25% - upon final acceptance.

SP 5. DIGITAL PHOTO DOCUMENTATION OF PROJECT:

Contractor shall take digital photos of the work on a daily basis throughout the entire duration of the project. Hard copy digital photo images shall be printed in color on a daily basis and stored with "As Built" drawings in a catalog that is kept orderly, labeled, and indexed using dates and locations (i.e. stations). Contractor shall also record two (2) complete sets of all digital photos taken during a week onto separate compact diskettes (CD). At the end of each week, one CD will be given to the Owner's representative immediately after it is recorded and one CD will be retained in a protective case with the "As-Built" Drawings. The complete set of compact diskettes retained with the "As-Built" Drawings and the hard copy catalog will be given to the Owner at the end of the project such that the Owner will end up with two (2) complete sets of digital photos on CDs and a catalog of hard copies. Contractor shall take a sufficient number of digital photos to adequately document the work and shall work closely with Owner's representative to determine the number and location of digital photos to be taken each day. Digital photos should generally include such items as fittings, major crossings of other utilities or petroleum pipelines, any unmapped utilities or pipelines, and items that may be the subject of future controversy, or any items related to extra work claims. No additional compensation will be provided for digital photo documentation. Include all costs in related items of work.

SP 6. SOLID WASTE COORDINATION:

Construction is not to impede weekly waste collection. Residential waste and brush & bulky service each occur once per week (not typically on the same day). The schedules are available at the City of Bryan's website www.bryantx.gov or can be reached directly at the following link http://gis.bryantx.gov/gis/website/waste_collection/viewer.htm or obtained through the City of Bryan's Environment Services Department.

The contractor is to work with the City of Bryan Solid Waste Division to make certain the impact to citizens is minimized. The city may be able to schedule pickup early on particular streets so that construction delay is minimized. The contractor is to work with the city as needed including scheduling, assisting in relocating garbage cans, etc. Whenever city garbage collection trucks are denied vehicular access to residential curb side pickup the contractor must collect the filled cans from each property and locate them in an area accessible to the collection truck prior to scheduled pickup. The contractor must also return the empty cans that day. Cans that are not addressed are interchangeable amongst properties. The contractor may want to note on the door hanger notifications that residential waste and brush and bulky pickup will occur on regularly scheduled days but that pick-up will occur as early as 7:00 a.m. during this time to facilitate construction.

City of Bryan

Record of Excavation

Instructions: This record must be prepared for each excavation in a readable, descriptive, and accurate manner. All necessary signatures must be present and approved prior to commencement of work. This record must be retained for (3) years.

Division: _____ Date of Excavation: _____

Period that the Excavation is open: (dates) _____

Specific Location: _____

Purpose: _____

Class of soil determined to be: (check one) ☐ A ☐ B ☐ C
(See Appendix A to Subpart P)

Soil test used: _____

Visual: ☐Layered ☐Cohesive ☐Granular ☐Gravel ☐Utilities
☐Water drains from sides or bottom

Manual: ☐Plasicity ☐Dry Strength ☐Thumb Penetration

1. All public utility systems notified? ☐Yes ☐No
2. Received permit to dig before digging? ☐Yes ☐No
   Time: _____ Date: _____
   Person: _____
3. Hazardous atmosphere tested? ☐Yes ☐No
4. Constructed means of egress from excavation? ☐Yes ☐No
5. Controlled exposure to vehicle traffic? ☐Yes ☐No
6. Controlled exposure to falling loads? ☐Yes ☐No
7. Warning system for mobile equipment? ☐Yes ☐No
8. Determined emergency rescue equipment needed and available? ☐Yes ☐No
9. Prepared for hazards of water accumulation? ☐Yes ☐No
10. Verified stability of adjacent structure? ☐Yes ☐No
11. Constructed protection from loose rock and soil daily ☐Yes ☐No
12. Scheduled a worksite inspection plan? ☐Yes ☐No
13. Prepared for fall protection? ☐Yes ☐No

<u>Excavation Diagram</u>: (Include length, width, depth)

<u>Diagram / Explain type of excavation protection</u>: (Be specific and note distances)

Competent Person in Charge of Excavation:

_____ _____

Signature Date

POLICY
UTILITY INSTALLATION NOTIFICATION

It is the policy of the City of Bryan Public Works Services Department and it's Divisions that all city work forces and/or city contractors performing work involving the installation of underground utilities provide adequate notification to utility companies prior to the commencement of any excavation activity.

Notification of all utility companies shall occur at least 2 Working Days in advance of the planned excavation activity in accordance with Chapter 251 of the State of Texas Utilities Code, Title 5. A record of the notification time, date, and person contacted shall be made and retained for the City of Bryan's records. City work forces under the direction of the Director of Public Works, shall forward a copy of this notification record to the Public Works Services Department's office. Contractors performing work under the direction of the Engineering Division shall forward a copy of the notification record to the City Engineer's office so that it may be filed in the Engineering Division's files. A form entitled "Utility Installation Notification Check-Off List" shall be used to maintain a record of notification activities.

If a utility company that has been duly notified fails to respond to a request for locating their underground facilities within the prescribed period, City of Bryan work forces and/or contractors are advised that they must notify the utility company and/or companies that work will commence on the planned underground excavation within 1 Working Day. It is the responsibility of the various utilities to respond to a request that its lines be located.

In no event should a city work force and/or contractor delay its work activities for a period exceeding 3 Working Days. If an underground utility company has not responded within the prescribed 3 Working Days, city work forces and/or its contractors are advised to commence the underground excavation activity. After the above described notification period has expired, all responsibility for underground utility breaks and/or ruptures become the responsibility of the owning utility company.

The following procedure will be followed when an emergency excavation of underground facilities is required. If the emergency condition will permit notification time, city work forces and/or contractors shall notify all utility companies that an emergency condition exists that may involve underground facilities owned by the utility company. The nature, location and commencement time of the planned excavation work necessary to resolve the emergency condition will be communicated to the utility companies. The utility company or companies shall advise the agency conducting the emergency excavation of the time necessary for them to respond to a location request. City work forces and/or contractors (agencies making emergency excavation) shall not be required to delay emergency repairs for a period exceeding the time to respond indicated by the utility company or companies. In the event that the emergency condition does not provide city work forces and/or contractors time for notification, emergency work will be completed and any damage to underground facilities will be reported to the owning utility company immediately following completion of the emergency work activity. Damage information reported to the utility company involved shall include the type of damage, location, time that the damage occurred, name of city department and/or contractor along with address and telephone number. All damage to facilities resulting from an emergency condition that did not allow notification time for underground locations will be considered the responsibility of the owning utility company.

UTILITY INSTALLATION NOTIFICATION
CHECK-OFF LIST

CONTRACTOR _____

PROJECT NO./SUBDIVISION _____

UTILITY	DATE/TIME UTILITY CALLED	DATE/TIME UTILITY RESPONDED	NAME OF UTILITY CONTACT
Texas One Call			
Verizon			
C.O.B. Engineering Dept.			
C.O.B. Water Services			
BTU			
SuddenLink Cablevision			
Atmos Gas			

Miscellaneous: _____

_____

_____

TELEPHONE NUMBERS FOR LOCATION OF CABLES & LINES

Texas One Call	1-800-245-4545
AT&T	1-800-252-1133
Sprint	1-800-443-1876
Southwestern Bell	1-800-669-8344
Verizon	1-800-344-8377
Southwestern Gas Pipeline	936-878-2482
Bryan Woodbine Gathering	979-778-8046 or 979-776-0285
BWOC	979-778-0069 or 979-776-0121
Exxon Pipeline Company	713-656-3315 or 979-272-8171
Energy Transfer	1-800-375-5702 or 210-403-7300
Atmos Gas	1-800-460-3030
SuddenLink Cablevision	979-846-2229
Wickson Crk. Spec. Utility District	979-589-3030

WAGE SCALE

As required by the Department of Labor in Washington, D.C., investigations have been made to determine the prevailing wage rates for the classes of labor expected to be involved in the various classes of labor on this project.

PREVAILING WAGE RATES IN THE LOCALITY OF THIS PROJECT FOR LABORERS, WORKMEN AND MECHANICS

CRAFT	BASIC HOURLY RATES
Air Tool Operator	$16.00
Asphalt Distributor Operator	12.09
Asphalt Paving Machine Operator	11.82
Asphalt Raker	9.96
Asphalt Shoveler	10.56
Broom or Sweeper Operator	9.74
Bulldozer Operator	11.04
Carpenter	12.25
Concrete Finisher (Paving)	10.53
Concrete Finisher (Structures)	10.95
Concrete Paving Curbing Machine Operator	14.00
Concrete Paving Finishing Machine Operator	12.00
Concrete Rubber	10.88
Crane, Clamshell, Backhoe, Derrick Dragline, Shovel Operator	13.66
Electrician	24.11
Flagger	9.49
Form Builder/Setter (Structures)	10.88
Form Setter (Paving and Curb)	9.89
Foundation Drill Operator (Truck Mounted)	15.00
Front End Loader Operator	11.36
Laborer - Common	9.34
Laborer - Utility	10.12
Mechanic	14.74
Mixer Operator (Concrete Paving)	15.25
Mixer Operator	10.83
Motor Grader Operator (Fine Grade)	15.26
Motor Grader Operator (Rough Grade)	12.96
Oiler	14.71
Painter - Structures	11.00
Pavement Marking Machine Operator	11.52
Pipe Layer	10.49
Planer Operator	17.45
Reinforcing Steel Setter (Paving)	15.50
Reinforcing Steel Setter (Structure)	14.00

CRAFT	BASIC HOURLY RATES
Roller Operator, Pneumatic (Self-Propelled)	9.34
Roller Operator, Steel Wheel Plant-Mix Pavement	10.24
Roller Operator, Steel Wheel (Other-Flat Wheel or Tamping)	9.60
Scraper Operator	9.93
Servicer	11.41
Sign Installer (PGM)	14.85
Slip Form Machine Operator	15.17
Spreader Box Operator	10.39
Structural Steel Worker	13.41
Tractor Operator (Crawler Type)	11.10
Traveling Mixer Operator	10.04
Trenching Machine Operator, Heavy	14.22
Truck Driver - Tandem Axle Semi-Trailer	10.95
Truck Driver - Lowboy/Float	15.30
Truck Driver - Single Axle - Heavy	11.88
Truck Driver - Single Axle- Light	9.98
Wagon Drill, Boring Machine, Post Hole Driller Operator	14.65
Welder	14.26
Work Zone Barricade Servicer	11.15

SALES TAX EXEMPTION CERTIFICATE

01-339 (Back)
(7/01/09)

TEXAS SALES AND USE TAX EXEMPTION CERTIFICATION

Name of purchaser, firm or agency City of Bryan, Engineering Division	
Address (street & number, P.O. Box or Route number P. O. BOX 1000	Phone (Area code and number) (979) 209-5030
City, State, ZIP code BRYAN, TEXAS 77805	

I, the purchaser named above, claim an exemption from payment of sales and use taxes for the purchase of taxable items described below or on the attached order or invoice form:

CONTRACTOR:

_____

Street Address: _____City, State, ZIP Code: _____

Description of items to be purchased or on the attached order or invoice:

All labor, materials, supplies and equipment purchased for and consumed or corporated in the City of Bryan Construction.

Project: _____

Project Manager: _____

CIP No.: _____

Purchaser claims this exemption for the following reason:

This contract is to be performed for an exempt organization as defined by sections 11. 11, 151.309, or 151.310 of the Tax Code of Texas. (Tax I.D. #1-74-6000441)

I understand that I will be liable for payment of sales and use taxes which may become due for failure to comply with the provisions of the Tax Code: Limited Sales, Excise, and Use Tax Act; Municipal Sales and Use Tax Act; Sales and Use Taxes for Special Purpose Taxing Authorities; County Sales and Use Tax Act; County Health Services Sales and Use Tax; The Texas Health and Safety Code; Special Provisions Relating to Hospital Districts, Emergency Services Districts, and Emergency Services Districts in counties with a population of 125,000 or less.

I understand that it is a criminal offense to give an exemption certificate to the contractor for taxable items that I know, at the time of purchase, will be used in a manner other than that expressed in this certificate and depending on the amount of tax evaded, the offense may range from a Class B misdemeanor to a felony of the second degree.

Purchaser's Signature	Title	Date
CHARLES CRYAN	CHIEF FINANCIAL OFFICER	July 1, 2009

NOTE: This certificate cannot be issued for the purchase, lease, or rental of a motor vehicle.
THIS CERTIFICATE DOES NOT REQUIRE A NUMBER TO BE VALID.
Sales and Use Tax "Exemption Numbers" or "Tax Exempt" Numbers do not exist.

This certificate should be furnished to the supplier. Do not send the completed certificate to the Comptroller of Public Accounts.

CITY OF BRYAN
GENERAL PROVISIONS AND REQUIREMENTS

I N D E X

GENERAL PROVISIONS AND REQUIREMENTS

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ITEM 1 - DEFINITION OF TERMS

1.1 **DEFINITION OF TERMS**: Wherever the words, forms or phrases defined herein or pronouns used in their place occur in these specifications, in the contract, in the bonds, in the advertisements, or any other document or instrument herein contemplated, or to which these specifications apply or may apply, the intent and meaning shall be interpreted as follows:

1.2 **ABBREVIATIONS**: Whenever the abbreviations defined herein occur on the Plans, in the specifications, contract, bonds, advertisement, proposal, or in any other document or instrument herein contemplated or to which the specifications apply or may apply, the intent and meaning shall be as follows:

1.3 **ADVERTISEMENT**: All of the legal publications pertaining to the work contemplated or under contract.

1.4 **BIDDER**: Any person, persons, partnership, company, firm, association or corporation acting directly or through a duly authorized representative submitting a proposal for the work contemplated.

1.5 **CITY**: The City of Bryan, Texas, a Municipal Corporation, acting by and through (a) its governing body, or (b) its City Manager, each of whom is required by Charter to perform specific duties. Responsibility for final enforcement of contracts involving the City of Bryan is by Charter vested in the City Manager.

1.6 **CITY ATTORNEY**: The City Attorney of the City of Bryan, Texas or his duly authorized assistants or agents.

1.7 **CITY COUNCIL**: The Council of the City of Bryan, Texas.

1.8 **CITY ENGINEER**: The City Engineer of the City of Bryan, Texas or duly authorized assistants, employees, or agents, including any inspectors, project managers, or others designated by the City Engineer to assist on the Project.

1.9 **CITY MANAGER**: The Manager of the City of Bryan, Texas.

1.10 **CITY SECRETARY**: The City Secretary of the City of Bryan, Texas or his duly authorized assistants or agents.

1.11 **CONTRACT**: The written agreement covering the performance of the work. The contract includes the advertisement, proposal, specifications, including special provisions, Plans or working drawings and any supplemental changes or agreements pertaining to the work materials thereof, and bonds.

1.12 **CONTRACTOR**: The person, persons, partnership, company, firm, association or corporation entering into contract for the execution of the work, acting directly or through a duly authorized representative.

1.13 **CONTRACT BOND**: The security furnished by the Contractor and Surety as a guarantee on the part of the Contractor to execute the work in accordance with the terms of the contract.

1.14 **FINAL COMPLETION**: The term "Final Completion" shall mean that all the work has been completed, all final punch list items have been inspected and satisfactorily completed, all payments to materialmen and subcontractors have been made, all documentation and warranties have been submitted, and all closeout documents have been executed and approved by the City.

1.15 **INSPECTOR**: The authorized representative of the City Engineer assigned to supervise or inspect any or all parts of the work and the materials to be used therein.

1.16 **MAYOR**: The Mayor of the City of Bryan, Texas.

1.17 **PLANS**: All drawings pertaining to the contract and made a part thereof, including such supplementary drawings or addenda as the City Engineer may issue in order to clarify other drawings, or for the purpose of showing changes in the work hereinafter authorized, or for showing details not shown thereon.

1.18 **PROPOSAL**: The written statement duly filed with the City Engineer by the person, persons, partnership, company, firm, association, or corporation proposing to do the work contemplated, including the approved form on which the formal bids for the work are to be prepared.

1.19 **PROPOSAL GUARANTEE**: The security designated in the advertisement and proposal, to be furnished by each bidder as a guarantee of good faith to enter into a contract with the City and execute the required bonds for the work contemplated after the work is awarded him.

1.20 **RIGHT-OF-WAY**: The land provided by the City upon which to construct the proposed work.

1.21 **SPECIAL PROVISIONS**: The special clauses setting forth the conditions or requirements peculiar to the specific project involved, supplementing the standard specifications, and taking precedence over any conditions or requirements of the standard specifications with which they are in conflict.

1.22 **SPECIFICATIONS**: The directions, provisions, and requirements contained herein or in a special specification, supplemented by such "Special Provisions" and "Supplemental Agreements" as may be issued or made pertaining to the method and manner of performing the work or to quantities and qualities of materials to be furnished under the contract. Where the phrases "Or directed by the City Engineer", “Ordered by the City Engineer”, or “To the satisfaction of the City Engineer” occur, it is to be understood that the directions, orders, or instructions to which they relate are within the limitations of the proposal and specifications. "Special Provisions" will cover work appertaining to a particular project and included in the proposal but not covered by the specifications and will govern and take precedence over specifications wherever in conflict therewith. "Supplemental Agreements" are written agreements entered into between the Contractor and the City are approved by the Surety, covering alterations and changes in Plans which are necessary to the proper completion of the work. Reference to standard specifications of Texas Department of Transportation (TxDOT), American Standard of Testing Materials (ASTM) and other organizations shall be interpreted to mean the latest published edition as of the date proposals are opened for this project.

1.23 **SUBSTANTIALLY COMPLETED**: The term "Substantially Completed" means that in the opinion of the City Engineer the Project, including all systems and improvements, is in a condition to serve its intended purpose but still may require minor miscellaneous work and adjustment. Final payment of the Agreement Price, including retainage, however, shall be withheld until Final Completion and acceptance of the work by the City. Acceptance by the City shall not impair or waive any warranty obligation of Contractor.

1.24 **SUPERINTENDENT**: The authorized representative of the Contractor.

1.25 **SURETY**: The corporate body which is bound with the Contractor as a guarantee of good faith on the part of the Contractor to execute the work in strict accordance with the Plans, specifications and terms of the contract.

1.26 **THE WORK**: All work, including the furnishing of labor, materials, tools, equipment, and incidentals, to be performed by the Contractor under the terms of the contract.

1.27 **WORKING DAY**: A working day is defined as a calendar day, not including Saturdays, Sundays or legal holidays in which weather or other conditions not under the control of the Contractor will permit the performance of the principal unit of work underway for a continuous period of not less than seven (7) hours between 7 a.m. and 6 p.m. Work on days other than a "working day" may be requested up to 48 hours in advance and requires approval by the City Engineer. If allowed, a working day will be charged and the Contractor shall pay the City for the cost of inspections services equal to $30.00 per hour for a minimum of 4 hours.

1.28 **CALENDAR DAY**: A calendar day includes all 7 days of the week, excluding legal holidays, under which the performance of the principal unit of work shall be performed between the hours of 7 a.m and 6 p.m. A calendar day will be charged regardless of weather or other conditions not under the control of the Contractor, unless the City Engineer approves, in writing, a suspension of time.

1.29 **BUSINESS DAY**: A business day is defined as a calendar day, not including Saturdays, Sundays, or legal holidays, between the hours of 8 a.m. and 5 p.m, during which business operations generally occur.

ABBREVIATIONS

A.A.S.H.T.O.	American Association of State Highway and Transportation Officials	Conc.	Concrete
A.S.T.M.	American Society for Testing and Materials	Diam. Cond. Corr.	Diameter Conduit Corrugated
Asph.	Asphalt	Culv.	Culvert
Ave.	Avenue	Dr.	Driveway
Blvd.	Boulevard	Elev.	Elevation
C.I.	Cast Iron	F.	Fahrenheit
C.L.	Center Line	Ft. or '	Foot or Feet
C.O.	Clean Out	Gal.	Gallon
Lb.	Pound	In. or "	Inch or Inches
M.H.	Manhole	Lin.	Linear
Max.	Maximum	R.O.W.	Right-of-Way
Min.	Minimum	Sq.	Square
Mono.	Monolithic	Std.	Standard
No.	Number	St.	Street
%	Percent	Str.	Strength
P.S.I.	Pounds per Square Inch	Vol.	Volume
R	Radius	Yd.	Yard
Reinf.	Reinforced	Cu.	Cubic

Table A

ITEM 2 - INSTRUCTIONS TO BIDDERS

2.1 PROPOSAL FORM

The City will furnish bidders with proposal forms, which will include the following:

- Project Data - Describes general location and work to be performed including any special concerns.
- Bid Proposal - An itemized list of work to be performed, materials to be furnished and the time the work is to be completed.

2.2 QUANTITIES IN PROPOSAL FORM

The quantities of the work and materials set forth in the proposal form or on the Plans approximately represent the work to be performed and materials to be furnished, and are for the purpose of comparing the bids on a uniform basis. Payment will be made by the City to the Contractor only for the actual quantities of work performed or materials furnished in accordance with the Plans and specifications, and it is understood that the quantities may be increased or decreased as hereinafter provided, without in any way invalidating the bid prices. Any item of work not covered in the proposal will not be paid for directly, but shall be considered as subsidiary to a regular bid item.

2.3 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF THE WORK

Bidders are advised that the Plans, specifications, and other documents on file with the City Engineer shall constitute all the information, which the City will furnish. Bidders are required, prior to submitting any proposal, to read and thoroughly familiarize themselves with the specifications including but not limited to the General Provisions, Special Provisions, Project Data, Current B/CS Unified Technical Specifications and Details, Current Texas Department of Transportation (TxDOT) Standard Specifications, current TxDOT Material Specifications, proposal, contract, and bond forms carefully, to visit the site of the work, to examine carefully local conditions, to inform themselves by their independent research, tests, and investigations of the difficulties to be encountered and judge for themselves of the accessibility of the work and all attending circumstances affecting the cost of doing the work or time required for its completion, and obtain all information required to make an intelligent proposal. No information given by the City or any official thereof, other than that shown on the Plans and contained in the specifications, proposals, and other documents, shall be binding upon the City. Bidders shall rely exclusively upon their own estimates, investigations, tests and other data which are necessary for full and complete information upon which the proposal may be based. It is mutually agreed that submission of a proposal is evidence that the bidder has made the examination, investigations, and tests required herein.

2.4 BIDDER QUALIFICATIONS

Bidders who have not had a contract with the City of Bryan with in the last five years must furnish sufficient written evidence that single bonafide contracts, in excess of two-thirds (2/3) of the face amount of this bid, have been successfully and satisfactorily completed on work of a similar nature. This evidence shall be furnished on a statement of bidder's qualifications included with the bid, and shall show job locations, type of projects, contract amounts and dates completed. The bidder must also complete a felony conviction notification form for any person convicted of a felony that will be working on the project. Failure to submit this evidence shall be just cause for disqualification of the bid. The successful Bidder, at the discretion of the City Engineer, may be required to furnish a complete financial statement prepared and certified to by a Certified Public Accountant.

2.5 PREPARATION OF PROPOSAL

The Bidder shall submit his proposal on the forms furnished by the City. All blank spaces in the form shall be correctly filled in and the Bidder shall state the prices numerically, written legibly in ink or typed, for which he proposes to do the work contemplated or furnish the materials required. The numerical unit prices shall govern over all other numbers submitted on the proposal. If the proposal is submitted by an individual, his name must be signed by him or his duly authorized agent. If the proposal is submitted by a firm, association or partnership, the name and address of each member must be given and the proposal signed by a member of the firm, association, or partnership, or person duly authorized. If the proposal is submitted by a company or corporation, the company or corporate name and business address must be given, and the proposal signed by an official or duly authorized agent, Powers of Attorney, authorizing agents, or others to sign proposals must be properly certified and must be in writing and submitted with the proposal.

If the Bidder/Contractor is a corporation, the original seal of corporation must be affixed to the bid bond, payment bond, performance bond and contract. If these documents are presented without the corporate seal, bidder/contractor must present a certificate of good standing from the Texas Secretary of State and must also present a separate resolution of the corporation's directors for each document stating that the individual whose signature appears on the document was authorized by directors to sign it on behalf of the corporation.

All addendums shall be acknowledged on the bid proposal; failure to do so may result in an automatic disqualification of the bid.

2.6 IRREGULAR PROPOSALS

Proposals will be considered irregular if they show any omissions, alterations of form, additions, or conditions not called for, unauthorized alternate bids, or irregularities of any kind. However, the City reserves the right to waive any irregularities and to make the award in the best interests of the City.

2.7 PROPOSAL GUARANTY

No proposal will be considered unless it is accompanied by an acceptable Cashier's Check or acceptable Bidder's Bond, payable unconditionally to the City of Bryan, Texas. The cashier's check or bidder's bond shall be in the amount of, not less than, that shown in the bid proposal instructions. All bids shall remain subject to acceptance for 90 business days after the day of the bid opening, unless the City and the bidder mutually agree to extend past the first 90 business days, but the City may, at the City's sole discretion, release any bid and return the bid security before that date. The proposal guaranty is required by the City as evidence of good faith and as a guarantee that if notice of intent to award the contract is issued by the City, the Bidder will execute the contract within five (5) business days and will furnish the required bonds and insurance certificates within seven (7) business days after the receipt of the fully executed contract.

2.8 FILING OF PROPOSAL

No proposal will be considered unless it is filed with the City Engineer's office in Bryan, Texas within the time limit for receiving proposals as stated in the advertisement. Each proposal shall be in a sealed envelope, plainly marked with the word, "Proposal", and the name or description of the project as designated in the Notice to Bidders. The proposal shall include the Proposal Form, Felony Conviction Notice, and Bonds. Statement of Contractor and References may also be submitted as part of the proposal.

2.9 WITHDRAWING PROPOSALS

A Bidder may withdraw his proposal provided his request in writing to do so is in the hands of the officials indicated in the Notice to Bidders by the time set for opening of proposals. A Bidder may change the unit prices in his proposal provided his request to do so is submitted in writing and is in the hands of the City Engineer prior to the time set for opening of proposals. Requests by telephone, fax, or email for changes in bid prices or for withdrawal of proposals will not be considered.

2.10 OPENING PROPOSALS

The proposals filed with the City Engineer will be opened and publicly read aloud as provided for in the Notice to Bidders, and shall thereafter remain on file with the City Engineer. No contract will be entered into based on such proposals until after at least two days have elapsed. Bidders or their agents are invited to be present.

2.11 DISQUALIFICATION OF BIDDER

Bidders may be disqualified and their proposal not considered for any of the following specific reasons:

(a) Reason for believing collusion exists among the Bidders.

(b) Reasonable grounds for believing that any Bidder is interested in more than one proposal for the work contemplated.

(c) The Bidder being interested in any litigation against the City.

(d) The Bidder being in arrears on any existing contract or having defaulted on a previous contract.

(e) Lack of competency as revealed by the financial statement, experience and equipment, questionnaires, background investigation by the City, etc.

(f) Uncompleted work that in the judgment of the City will prevent or hinder the prompt completion of additional work if awarded.

(g) Proposals in which prices are unbalanced (disproportionately allocated among the bid items).

(h) The City of Bryan is adopting the written criteria for this project that Contractors with two (2) trench failure accidents including one (1) death resulting from trench failure in the last five (5) years will be grounds to disqualify bids. This disqualification is not automatic as the City reserves the right to study the corrective action and present preventative measure implied by Contractors who exceed these criteria.

ITEM 3 - AWARD AND EXECUTION OF CONTRACT

3.1 CONSIDERATION OF BIDS

After proposals are opened, the proposals will be tabulated for comparison on the basis of the bid prices and quantities shown in the proposal. The City of Bryan reserves the right to accept or reject any or all bids, to waive any informalities and technicalities, to accept the offer considered most advantageous **in order to obtain the best value for the City.** Causes for rejection of a bid may include but shall not be limited to the bidder's current violation of any City ordinance, the bidder's current inability to satisfactorily perform the work or service, or the bidder's previous failure to properly and timely perform its obligations under a contract with the City. Bidders may be disqualified and rejection of proposals may be recommended for any (but not limited to) of the following causes: 1) Failure to use the proposal form furnished by the City; 2) Lack of signature by an authorized representative on the proposal form; 3) Failure to properly complete the proposal; 4) Evidence of collusion among proposers; 5) Omission of uncertified personal or company check as a proposal guarantee **(if Bid Bond required)**; or 6) Unauthorized alteration of bid form. City reserved the right to waive any minor informality or irregularity.

All bidders are hereby notified that the City of Bryan shall consider all factors it believes to be relevant in selecting the offer that provides the best value for the City including, but not limited to the purchase price, the proximity of the bidder as it relates to the ability to perform the contract for the City of Bryan, the delivery date, the reputation of the bidder and the bidder's goods or services, the quality of the bidder's goods or services, the bidder's past performance under contracts with the City of Bryan, and the bidder's compliance with City ordinances. The City of Bryan may conduct reference checks as needed to evaluate bids. The Contractor will be required to submit a list of 6 references with each bid proposal. The City reserves the right to contact other companies or individuals that can provide information to the City that will assist the City in evaluating the capability of the bidder.

The City of Bryan, Texas is committed to obtaining its goods, products and services at the lowest price possible which benefits all the citizens of Bryan. Therefore, in order to accomplish this objective/goal, it is not the intention of the City neither to exclude particular vendors or manufacturers nor to create restrictive situations in its request for bids and proposals. Any manufacturer's names, trade names, brand names, catalog numbers, technical data, etc. used in the specifications are there for the sole purpose of establishing and describing general performance, quality levels, type and dimensions and such references are not intended to be restrictive. Alternate bids on similar or comparable products and/or services of any manufacturer or vendor equal to the products and/or services described in the specifications are invited and will be given careful consideration provided the alternate will accomplish the same task. The City of Bryan shall be the sole judge on whether the alternate product and/or service is similar to, equal to and in compliance with that specified. The decision of the City shall be final.

"In literal compliance" in reference to standards and specifications shall mean the meeting or exceeding of all or nearly all of the said standards and specifications. If the City determines that standards and specifications are in literal compliance where not all standards and specifications have been met or exceeded, the City must base such a determination on its

finding that any standards and specifications which have not been met or exceeded do not render the bidder product any less usable for the purpose for which it is intended.

3.2 AWARD OF CONTRACT

The City shall award the bid to obtain the best value to the City. The City's determination of best value determination may be based on a number of factors including but not limited to the following:

(a) the purchase price, including payment discount terms;
(b) the reputation of the bidder and of the bidder's goods or services;
(c) the quality of the bidder's goods or services;
(d) the extent to which the goods or services meet the City's needs;
(e) the bidder's past relationship with the City;
(f) the impact on the ability of the City to comply with laws and rules relating to contracting with historically underutilized businesses and nonprofit organizations employing persons with disabilities;
(g) the total long-term cost to the City to acquire the bidder's goods or services; and
(h) any relevant criteria specifically listed in this bid document.

The City reserves the right to withhold the award of the contract for a period of 90 business days from date of opening proposals. In no case will contract be awarded until at least two business days shall have elapsed from time of opening proposals. The City of Bryan reserves the right to award the bid in order to obtain the best value for the City.

3.3 RETURN OF PROPOSAL GUARANTY

As soon as proposal prices have been tabulated for comparison of bids, the City may, at its discretion, return the proposal guaranties accompanying the proposals which, in its judgment, would not be considered in the award; all other proposal guaranties will be retained by the City until the required contract and bonds have been executed, after which they will be returned. No proposal guaranties will be returned until at least two business days shall have elapsed from time of opening proposals.

3.4 PERFORMANCE AND PAYMENT BONDS

Within seven (7) business days after receiving the fully executed contract, the Contractor shall file with the City a good and sufficient performance bond in an amount equal to one hundred percent of the total amount of the contract, as evidenced by the proposal, guaranteeing the full and faithful execution of the work and performance of the contract.

When the contract amount is $25,000 or more, a performance and a payment bond in an amount of not less than one hundred percent (100%) of the contract price, conditioned upon faithful performance of the contract in accordance with the plans, specifications and contract documents and payment to all persons supplying labor and materials, and for the protection of the City and all other persons against damage by reason of negligence of the Contractor, or improper execution of the work, or the use of inferior materials shall be executed by the successful bidder and shall accompany the signed contract. Bonds shall remain in full force

and effect for one year after written notice of acceptance of the completed work is received from the City.

No sureties will be accepted by the City who are now in default or delinquent on any bonds or who are interested in any litigation against the City. All bonds shall be made on forms furnished by the City, and shall be executed by an approved surety company authorized to do business in the State of Texas and acceptable to the City. Each bond shall be executed by the Contractor and the sureties.

Should any surety on the contract be determined unsatisfactory at any time by the City Council, notice will be given the Contractor to that effect and the Contractor shall immediately provide a new surety satisfactory to the City. No payment will be made under the contract until the new surety or sureties, as required, have been accepted by the City.

No Performance and Payment bonds shall be required on any City contract less than $25,000.00. In the event that these bonds are not furnished by the Contractor, only one estimate (final) will be paid and that shall be upon completion of the project.

3.5 EXECUTION OF CONTRACT

The person or persons, partnership, company, firm, association, or corporation to whom a notice of intent to award a contract is provided shall, within five (5) business days after such notice, sign the necessary agreements and return four originals to the City. No contract shall be binding on the City until it has been attested by the City Secretary, approved as to form by the City Attorney, executed for the City by the designated City representative, and delivered to the Contractor.

If the Bidder/Contractor is a corporation, bidder/contractor must present a certificate of good standing from the Texas Secretary of State dated no more than 30 days preceding the date of submission of the bidder's proposal and must also present a separate resolution of the corporation's directors for each document stating that the individual whose signature appears on the document was authorized by directors to sign it on behalf of the corporation. All other business must provide proof of eligibility to conduct business in the State of Texas dated no more than 30 days preceding the date of submission of the bidder's proposal and evidence satisfactory to the City of Bryan that the bid and the contract and related documents have been duly authorized as applicable to the type of business entity.

3.6 FAILURE TO EXECUTE CONTRACT

The failure of the bidder to execute the contract, provide the required bonds or provide proof of the required insurance coverage within the time allotted shall be considered by the City as an abandonment of his proposal and the City may annul the award. By reason of the uncertainty of the market prices of materials and labor, and it's being impracticable and difficult to determine accurately the amount of damages accruing to the City by reason of said bidder's failure to execute the contract, provide the required bond or provide proof of the required insurance coverage within the time allotted, the proposal guaranty accompanying the proposal shall be the agreed amount of damages which the City will suffer by reason of such failure on the part of the bidder, and shall thereupon immediately be forfeited to the City. The filing of a proposal will be considered as an acceptance of this provision.

3.7 BEGINNING OF WORK

The Contractor shall not begin work until notified in writing by the City Engineer to do so.

ITEM 4 - SCOPE OF WORK

4.1 INTENT OF PLANS AND SPECIFICATIONS

The intent of the Plans and specifications is to prescribe a complete work or improvement, which the Contractor undertakes to do in full compliance with the Plans, specifications, special provisions, proposal and contract. Unless otherwise provided, the Contractor shall furnish all labor, tools, materials, machinery, equipment, and incidentals necessary for the proper prosecution and completion of the work.

4.2 SPECIAL PROVISIONS

Should any work or conditions which are not covered by these specifications be anticipated on any proposed work, "Special Provisions" for such work will be prepared by the City previous to the time of receiving the bids, and shall be considered as a part of the specifications and contract and complied by the Contractor.

4.3 INCREASED OR DECREASED QUANTITIES OF WORK

The City reserves the right to alter the quantities of work to be performed by either increasing or decreasing the quantities at any time when it is found necessary, and the Contractor shall perform the work as altered, increased or decreased, at the contract unit prices. Any allowance will not be made for anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond.

4.4 ALTERATION OF PLANS AND SPECIFICATIONS

The City reserves the right to make such changes in the Plans and specifications and in the character of the work as may be necessary or desirable to insure completion in the most satisfactory manner, provided such changes do not materially alter the original Plans and specifications or change the general nature of the work as a whole. Such changes shall not be considered as waiving or invalidating any condition or provision of the contract and bond.

4.5 EXTRA WORK

When any work is necessary to the proper completion of the project for which no prices are provided for in the proposal and contract, the Contractor shall do such work, but only when and as ordered in writing by the City Engineer. Payment for extra work will be made by "Supplemental Agreement" as outlined in Item 9 - Measurement and Payment.

4.6 STORMWATER POLLUTION PREVENTION

The Contractor shall comply with the TCEQ Construction General Permit No. TXR 150000 and maintain appropriate SWPPP documentation on site.

The Contractor shall take precaution to prevent the deposition of mud from the construction site on adjoining property, roads, streets and alleys during construction. These shall remain in a clean and usable condition. The contractor is responsible for providing erosion control

measures during all phases of construction. Appropriate use of silt fence and storm sewer inlet protection is the contractor's responsibility and should be maintained throughout the projects duration. The contractor shall place plastic, wood, or another barrier between spoils and paved areas to prevent embedding into the pavement.

For waterline or sewer line construction, the Contractor shall keep adjacent streets and/or alleys in a clean and usable condition as the job progresses. All sedimentation control measures shall be maintained in an effective operating condition during construction. This will prevent removal of sediment and mud from the project by wind or water.

4.7 FINAL CLEANUP

Upon the completion of the work and before acceptance and final payment will be made, the Contractor shall clean and remove from the site of the work all surplus and discarded materials, temporary structures, and debris of every kind. All equipment shall be removed from the job site after completion or acceptance of the construction work. If excavated material is placed on private property, it shall be the Contractor's responsibility to provide the City Engineer with a written statement signed by the property owner stating that the property owner requested the material and is satisfied with the condition in which the property was left. All excavated material containing any oil based products or asphaltic products must be disposed of at a licensed sanitary landfill. All brush that is not burned must be disposed of at a licensed compost facility. The Contractor will be allowed to burn debris in the right of way, provided that he obtains a permit to burn said debris from the City of Bryan Fire Marshall twenty-four (24) hours in advance of any burning. Permits will be issued on a day to day basis only and the Contractor shall be totally responsible for any damage incurred due to burning. No brush, oil- based soil, or asphaltic products will be allowed to be placed on private property. Material is not to be placed in floodplain without prior approval by the City's Floodplain Administrator. The Contractor shall be totally responsible for any damage incurred due to illegal dumping. He shall leave the site of the work in a neat and orderly condition equal to that which originally existed. Surplus and waste materials removed from the site of the work shall be disposed of at a licensed sanitary landfill or as directed by the City Engineer. No payment will be made for this work, its cost being subsidiary to the various bid items.

ITEM 5 - CONTROL OF THE WORK

5.1 AUTHORITY OF THE CITY ENGINEER

All work shall be performed under the inspection of the City Engineer in a workmanlike manner and to the satisfaction of the City Engineer and in accordance with the contract, Plans and specifications. The City Engineer shall decide all questions which arise as to the quality and acceptability of materials furnished, work performed, rate of progress of the work, interpretation of the Plans and specifications, acceptable fulfillment of the Contract, compensations, mutual rights between Contractors under these specifications, and suspension of the work. The City Engineer shall determine the amount and quality of the work performed and materials furnished, and those decisions and estimates shall be final. The City Engineer's estimate of the amount of work done shall be a condition precedent to the right of the Contractor to receive money due him under the contract.

5.2 CONFORMITY WITH PLANS

All work shall conform to the lines, grades, cross-sections, details and dimensions shown on the Plans. Any deviation from the Plans that may be required by the contingencies of construction will be determined and authorized by the City Engineer. All shop or fabrication details shall be furnished by the Contractor and checked and approved by the City Engineer.

5.3 EXISTING STRUCTURES

The Plans show the locations of all known surface and subsurface structures, however, the location of many gas mains, water mains, conduits, sewers, etc. is unknown, and the City assumes no responsibility for failure to show any or all these structures on the Plans or to show them in their exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for additional compensation for extra work or for increasing the pay quantities in any manner whatsoever, unless the obstruction encountered is such as to necessitate changes in the lines or grades, or require the building of special work, provisions for which are not made in the Plans and Proposal, in which case, at the decision of the City Engineer, the provisions in these specifications for extra work shall apply.

The Contractor shall exercise caution while working at a location where proposed construction crosses or comes into proximity with an underground telephone cables or wires, gas line, waterline, sewer line or any other utility line. EXTREME CAUTION shall be taken when working around petroleum pipeline or high pressure gas lines.

It shall be the Contractor's responsibility to contact the utility at least two (2) working days (excluding Saturday, Sunday and Holidays) prior to construction and obtain exact location of all underground utility lines and appurtenances where possibility of a conflict exists. The contractor shall coordinate with BTU for support with existing power poles, relocation of guy wires, and overhead lines. Unnecessary damage to utilities or appurtenances within and outside the limits of construction shall be repaired at the Contractor's expense.

It is the Contractor's responsibility to notify and coordinate any repair of utilities required for the proper construction of this project, including utilities owned by the City. If City of Bryan

assistance is required for the repair, the contractor must give advanced notice so that a work order can be issued from the specific department. The attached Utility Notification Check-off List, included within this contract, shall be filled out and kept on-site during construction.

5.4 COORDINATION OF PLANS, SPECIFICATIONS, PROPOSAL AND SPECIAL PROVISIONS

The Plans, specifications, proposal, special provisions, and all supplementary documents are intended to describe a complete work and are essential parts of the contract. A requirement occurring in any of them is binding. In case of discrepancies, figured dimensions shall govern over scaled dimensions; Plans shall govern over specifications; special provisions shall govern over both Technical Specifications and Plans; quantities shown on the Plans shall govern over those shown in the Proposal. The Contractor shall not take advantage of any apparent error or omission in the Plans and specifications, and the City Engineer shall be permitted to make such corrections or interpretations as may be deemed necessary for the fulfillment of the intent of the Plans and specifications. In the event the Contractor discovers an apparent error or discrepancy, he shall immediately call this to the attention of the City Engineer.

5.5 COOPERATION OF CONTRACTOR

The Contractor shall give the work the consistent attention necessary to facilitate the progress thereof, and he shall cooperate with the City Engineer, his inspectors, and with other Contractors in every way possible. The Contractor shall provide all facilities to enable the City Engineer and his inspectors to inspect the workmanship and materials entering into the work.

5.6 CONSTRUCTION STAKES

The City Engineer will furnish the Contractor with all grades, lines and measurements necessary for proper prosecution and control of the work. It shall be the responsibility of the Contractor to provide and maintain all construction staking on this project necessary for the proper performance and control of the work. This work is to be performed under the direct supervision of a Registered Public Land Surveyor, licensed in the Sate of Texas. Certified cut sheets must be provided to the City Engineer before commencing work. All costs associated with surveying shall be subsidiary to the various bid items.

5.7 AUTHORITY AND DUTIES OF INSPECTORS

Inspectors will be authorized to inspect all work done and all materials furnished. In case of any dispute arising between the Contractor and the Inspector as to the materials furnished or the manner of performing the work, the Inspector will have authority to reject materials or suspend work until the question at issue can be referred to and decided by the City Engineer. The Inspector will not, however, be authorized to revoke, alter, enlarge, or release any requirement of these specifications, not to approve or accept any portion of work, nor to issue instructions contrary to the Plans and specifications. He will in no case act as foreman, nor perform other duties for the Contractor, nor interfere with the management of the work.

5.8 PROJECT SAFETY

Where trench depths or other excavations exceed a depth of 5 feet, the Contractor must use protective devices as specified on OSHA Standard 29 CFR Part 1926, Subpart P and appendices thereto. A trench shoring plan in accordance with Vernon's Health and Safety Code Section 756.021 shall be submitted by the Contractor prior to issuance of a work order for this project. All soil for this project shall be classified as type "C" soil.

The "City of Bryan Excavation Policy" is hereby made part of these specifications and shall be adhered to for this project. The "Record of Excavation" form that is to be filled out by the Contractor at the time of excavation is included in this contract. A full copy of this policy is available for review at the City of Bryan City Engineering Division, and/or can be mailed upon request. For additional information about this requirement, contact City of Bryan Risk Management Services at (979) 209-5056.

The Contractor will be required to furnish and erect adequate protective devices (barricades, warning signs, lights, etc.) to ensure safe conditions once construction has begun. Barricades shall be painted in a color that will be visible at night.

The Contractor shall submit a Traffic Control Plan to the City Engineer, which must be approved before the Contractor begins work. The City Engineer reserves the right to change the Traffic Control Plan at anytime.

The Contractor will be held responsible for all damage to the work due to failure of barricades, signs, lights, and watchmen to protect it. Under any and all circumstances signs, barricades, lights, and other traffic control devices shall conform to the requirements of the Texas Manual on Uniform Traffic Control Devices with respect to design, application and maintenance.

5.9 INSPECTION

The Contractor shall furnish the City Engineer with every reasonable facility for ascertaining whether or not the work as performed is in accordance with the requirements and intent of the specifications and contract. Any work shall not be done nor materials used without suitable supervision or inspections.

5.10 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

All work, which has been rejected or condemned, shall be repaired or if it cannot be repaired satisfactorily, it shall be removed and replaced at the Contractor's expense. Defective materials shall be immediately removed from the site of the work. Work done without line and grades having been given, work done beyond the lines or not in conformity with the grades shown on the Plans or as given, save as herein provided, work done without proper inspection, or any extra or unclassified work done without written authority and prior agreement in writing as to prices shall be done at the Contractor's risk, and will be considered unauthorized, and at the option of the City Engineer may not be measured and paid for, and may be ordered removed at the Contractor's expense. Upon failure of the Contractor to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized or condemned work or materials immediately after receiving notice from the City Engineer, the City

Engineer will, after giving written notice to the Contractor, have the authority to cause defective work to be remedied or removed and replaced, or to cause unauthorized work to be removed and to deduct the cost thereof from any monies due to the Contractor.

5.11 FINAL INSPECTION

The City Engineer will make final inspection of all work included in the contract as soon as practicable after the work is completed and ready for acceptance. If the work is not acceptable to the City Engineer at the time of such inspection, he will inform the Contractor as to the particular defects to be remedied before final acceptance will be made.

5.12 PUNCH LIST INSPECTION

At the request of the Contractor, on or near the date construction has ended, the City shall conduct a punch list inspection to identify additional work to be done, improper or incomplete work to be corrected, or other deficiencies in the work, a list of which shall be provided to the Contractor. If all items on the list are not completed, corrected, or otherwise resolved within 20 calendar days of the date of publication of the list, the City may use the retainage held from the Contractor to complete the items on the list.

5.13 AS-BUILT DRAWINGS

The Contractor shall furnish to the City, one set of clean, red-lined as-built prints showing elevations, depth of bury for all utility lines, any deviations from contract drawings, etc. prior to final acceptance of the project. The cost of providing "As-Builts" will be subsidiary to the various bid items. Final retainage will not be released until all required documents have been delivered and all changes have been incorporated.

ITEM 6 - CONTROL OF MATERIALS

6.1 SOURCE OF SUPPLY OF MATERIALS

The materials shall be of the best procurable as required by the Plans, specifications and special provisions. The Contractor shall not start delivery of materials until the City Engineer has approved the source of supply. Only materials conforming to these specifications shall be used in the work. The Contractor shall furnish approved materials from other sources, if for any reason the product from any source at any time before commencement or during the prosecution of the work proves unacceptable. After approval, any materials that have become unfit for use will not be permitted in the work.

6.2 SAMPLES AND TESTS OF MATERIALS

Where, in the opinion of the City Engineer or as called for in the specifications, tests of materials are necessary, such tests will be made at the expense of the City unless otherwise provided. The failure of the City to make any tests of materials shall in no way relieve the Contractor of his responsibility of furnishing materials conforming to the specifications. The Contractor shall furnish adequate samples without charge.

The Contractor shall submit to the City Engineer proof (manufacturer's certificates, test reports, mill reports, etc.) that all materials proposed for use in construction of this project meet the appropriate specifications. The City Engineer may require testing or retesting by an acceptable independent testing laboratory of any materials submitted for use in this project. If this testing indicates the materials to be unsatisfactory, the Contractor shall be required to pay for these tests, and supply materials that comply with said specification.

Standard control tests will be made during construction to determine that all materials and construction procedures meet the standards and specifications prescribed. The cost of tests performed on materials that do not comply with specifications shall be deducted from the monthly payments to the Contractor.

The City Engineer reserves the right to have the Contractor submit test reports by an independent testing lab showing construction materials conform to the City of Bryan Standard Specifications or referenced specifications.

6.3 STORAGE OF MATERIALS:

Materials shall be stored so as to insure the preservation of their quality and fitness for the work. When directed by the City Engineer, they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground, and shall be placed under cover when directed. Stored materials shall be placed and located so as to facilitate prompt inspection. If material is stored on private property, the Contractor will provide the City Engineer with written approval of the property owner. No materials shall be stored within the limits of the FEMA regulated 100 year floodplain.

6.4 DEFECTIVE MATERIALS

All materials not conforming to the requirements of these specifications will be rejected and shall be removed immediately from the site of the work unless permitted to remain by the City Engineer. Upon failure on the part of the Contractor to comply with any order of the City Engineer made under the provisions of this item, the City Engineer will have authority to remove and replace defective material and to deduct the cost of removal and replacement from any money due to or become due the Contractor.

6.5 ARRANGEMENT AND CHARGE FOR WATER FURNISHED BY THE CITY

Where the Contractor desires to use City water in connection with any construction work, he shall make complete and satisfactory arrangements with the City for so doing. Where meters are used, the charge for water will be at the regular established rate; where no meters are used, the charge will be as prescribed by ordinance, or where no ordinance applies, payment shall be made on that estimated by the City.

6.6 PRODUCT SUBMITTALS

The Contractor shall provide product submittals as applicable and as outlined in the technical specifications for each project. These may include but are not limited to the following:

Work Plan indicating sequence and schedule
Material storage location
Subcontractors to be used with the percentage of work those subcontractors will complete
Test reports for all required tests identified in the specifications and plans
Hot Mix Asphaltic Concrete Mix Design
Portland Cement Concrete Mix Design
Cement sand
Steel rebar
Pipe material
Pipe fittings
Valves
Manholes
Fire hydrants

ITEM 7 - LEGAL RELATIONS AND PUBLIC RESPONSIBILITY

7.1 LAWS TO BE OBSERVED

The Contractor shall at all times observe and comply with all Federal and State laws and City Ordinances and regulations, which in any manner affect the conduct of the work, and shall observe and comply with all orders, laws, ordinances and regulations which exist or which may be enacted later by bodies having jurisdiction or authority for such enactment.

No plea of misunderstanding or ignorance thereof will be considered. The Contractor and his sureties shall indemnify and save harmless the City and all its officers, agents and employees against any claims or liability arising from or based on the violation of any such law, ordinance, regulation or order whether by himself or his employees, or sub- contractors.

7.2 PERMITS AND LICENSES

The Contractor shall obtain all permits and licenses, and give all notices necessary and incident to the due and lawful prosecution of the work. All City of Bryan fees for permits will be waived.

7.3 STATE AND CITY SALES TAXES

The Contractor's attention is directed to Texas House Bill 11 (72nd Legislature, 1st C.S.), which amended the Texas Tax Code Section 151.311. This amendment provides that by the Contractor entering into a separate contract, the Contractor will become a seller of materials purchased for the project, which will obviate paying taxes on materials incorporated into the project.

As a seller, the Contractor purchases materials and issues a resale certificate instead of paying the sales tax at the time of purchase. The City, as an exempt entity, will provide the Contractor with an exemption certificate at the time of the "sale" of the materials to the City, thereby precluding the City, and Contractor, from paying the sales tax on the materials.

Services are not tax exempt. The Contractor will be required to pay all appropriate taxes for all services as set forth herein.

For purpose of these Contract Documents, the following definitions are provided for materials and services:

> Materials: Materials are those items that are tax exempt and are physically incorporated into the facility constructed for the City. Materials include, but are not limited to, purchased items such as the filters, pumps, valves, pipe, fittings, concrete, asphalt, road-base and sub-base, electrical equipment, building components, etc.
> Services: Services are those items that are not tax exempt and are items used by the Contractor but that are not physically incorporated into the City's facility and/or are items which are consumed by construction. Services include, but are not limited to items, such as supplies, tools, concrete form, scaffolding, temporary storage buildings, the purchase or rental or lease of equipment, skill and labor, etc.

For further information concerning taxes as they related to materials and services, the Contractor shall refer to House Bill 11 and/or contact the Texas Comptroller of Public Accounts, Austin, Texas.

7.4 PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor is required or desires to use any design, device, material or process covered by letters patent or copyrighted he shall provide for such use by suitable legal agreement with the patentee or owner. It is mutually agreed and understood that without exception, contract prices shall include all royalties or costs arising from patents, trademarks and copyrights in any way involved in the work. The Contractor and his sureties shall indemnify and save harmless the City from any and all claims for infringement by reason of the use of any such patented design, device, materials or process or any trademark or copyright in connection with the work agreed to be performed under this contract and shall indemnify the City for any cost, expense, or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

7.5 SANITARY PROVISIONS

The Contractor shall establish and enforce among his employees such regulations in regard to cleanliness and disposal of garbage and waste as will tend to prevent the inception and spread of infectious or contagious diseases and to prevent effectively the creation of a nuisance about the work on any property either public or private, and such regulations as are required by the City Engineer shall be put into immediate force and effect by the Contractor. The necessary sanitary conveniences for the use of laborers on the work, properly secluded from public observation, shall be constructed and maintained by the Contractor in such manner and at such points as will be approved by the City Engineer, and their use shall be strictly enforced by the Contractor. All sanitary laws and regulations of the State of Texas and the City of Bryan shall be strictly complied with.

7.6 PUBLIC CONVENIENCE AND SAFETY

Materials stored about the work shall be so placed, and the work shall at all times be so conducted as to cause no greater obstruction to the public than is considered necessary by the City Engineer. The Contractor shall make provisions by bridges or other means at all cross streets, highways, sidewalks, and private driveways for the free passage of pedestrians and vehicles, provided that where bridging is impractical or unnecessary in the opinion of the City Engineer, the Contractor may make arrangements satisfactory to the City Engineer for the diversion of traffic and shall, at his own expense, provide all material and perform all work necessary for the construction and maintenance of roadways and bridges for the diversion of traffic.

The City reserves the right to remedy any neglect on the part of the Contractor as regards the public convenience and safety which may come to its attention, after twenty-four hours notice in writing to the Contractor, save in cases of emergency, when it shall have the right to remedy any neglect without notice; and in either case, the cost of such work done by the City shall be deducted from monies due or to become due the Contractor. The Contractor shall notify the City Engineer when any street is closed or obstructed and when directed by the City Engineer shall keep any street or streets in condition for unobstructed use by the fire

apparatus. Where the Contractor is required to construct temporary bridges or make other arrangements for crossings over ditches or streams, his responsibility for accidents shall include the roadway approaches as well as the structures for such crossings.

The Contractor shall conform to all federal, state and local safety regulations and specifically follow those contained in the City of Bryan Safety policy and procedures manual.

7.7 PRIVILEGES OF CONTRACTOR IN STREETS, ALLEYS AND RIGHT-OF-WAYS

For the performance of the contract, the Contractor will be permitted to occupy such portion of streets or alleys, or other public places or other right-of-ways as provided for in the ordinances of the City, as shown on the Plans or as permitted by the City Engineer. A reasonable amount of tools, materials and equipment for construction purposes may be stored in such space, but not more than is necessary to avoid delays in the construction. Excavation and waste materials shall be piled or stacked in such a way as not to interfere with spaces that may be designated to be left free and unobstructed, and not inconvenience occupants of adjoining property. Other Contractors of the City may, for all purposes required by their contracts, enter upon the work and premises used by the Contractor, and the Contractor shall give to other Contractors of the City all reasonable facilities and assistance for the completion of adjoining work. Any additional grounds desired by the Contractor for his use shall be provided him at his own expense.

7.8 RAILWAY CROSSINGS

Where the work encroaches upon any right-of-way of any railway, the City will secure the necessary easement for the work. Where railway tracks are to be crossed, the Contractor shall observe all the regulations and instructions of the railway company as to methods of doing work, or precautions for safety of property and the public. All negotiations with the railway company, except for right- of-way, shall be made by the Contractor. The railway company shall be notified by the Contractor not less than five days previous to time of his intentions to begin work. The Contractor will not be paid direct compensation for such railway crossing, but shall receive only the compensations as set out in the proposal.

7.9 BARRICADES, LIGHTS AND WATCHMEN

Where the work is carried on in, or adjacent to any street, alley or public place, the Contractor shall at his own cost and expense furnish and erect such barricades, fences, lights, and danger signals, shall provide such watchmen and shall take such other precautionary measures for the protection of persons or property and of the work as are necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade. A sufficient number of barricades shall be erected to keep vehicles from being driven on or into any work under construction. The Contractor shall furnish watchmen in sufficient number to protect the work.

The Contractor will be held responsible for all damage to the work due to failure of barricades, signs, lights, and watchmen to protect it, and whenever evidence is found of such damage, the City Engineer may order the damaged portion immediately removed and replaced by the Contractor at his own expense. The Contractor's responsibility for the maintenance of

barricades, signs and lights, and for providing watchmen, shall not cease until the project shall have been accepted by the City.

Under any and all circumstances, signs, barricades, lights and other traffic control devices shall conform to the requirements of the Texas Manual on Uniform Traffic Control Devices with respect to design, application and maintenance. As required by the City Engineer, the Contractor will submit a traffic control plan. The City Engineer reserves the right to modify the plan at any time.

7.10 CONFINED SPACE ENTRY

The Contractor shall verify that safe working conditions are maintained for all confined space entries in accordance with OSHA 29CFR 1910.126 "Permit Required Confined Spaces", ANSI Z117.1 "Safety Requirements for Confined Spaces" and NIOSH 80-106 "Criteria for a Recommended Standard for Working in a Confined Space". All confined spaces must be evaluated as either permit required or low hazard permit spaces by a person knowledgeable in these regulations before entry.

A "Permit Required for Confined Space" is any space employees can bodily enter and perform assigned work, which by design has limited openings for entry and exit, has the potential for engulfment or hazardous gases or which is not intended for continuous employee occupancy.

A "Low Hazard Permit Space" is a permit space where there is an extremely low likelihood that dangerous gases or engulfment hazards could be present and where all other serious hazards have been controlled.

7.11 USE OF EXPLOSIVES

The use of explosives is prohibited on City Projects.

7.12 PROTECTION AND RESTORATION OF PROPERTY

Where the work passes over or through private property, the City will provide the necessary right-of-way. The Contractor shall not enter upon private property for any purpose without having previously obtained permission from the property owner. The Contractor shall be responsible for the preservation of, and shall use every precaution to prevent damage to, all trees, shrubbery, plants, lawns, fences, culverts, bridges, pavements, driveways, sidewalks, etc., to all water, sewer, and gas lines, to all conduits, to all overhead pole lines, and appurtenances thereof; and to all other public or private property, along or adjacent to the work. The Contractor shall notify the proper representatives of any public utility, corporation, any company or individual, not less than forty-eight hours in advance of any work which might damage or interfere with the operation of their or his property along or adjacent to the work. The Contractor shall be responsible for all damages or injury to property of any character resulting from any act, omission, neglect, or misconduct in the manner of executing the work, or due to his non-execution of the work, or any time due to defective work or materials, and said responsibility shall not be released until the work shall have been completed and accepted.

When and where any direct or indirect damage or injury is done to public or private property on account of any act, omission, neglect or misconduct in the execution of the work or in consequence of the non-execution thereof on the part of the Contractor, he shall restore or have restored at his own expense such property to a condition equal to or better than that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage from injury in a manner acceptable to the owner or the City Engineer. In case of failure on the part of the Contractor to restore such property or make good such damage or injury; the City Engineer may, upon forty-eight (48) hours written notice, under ordinary circumstances and without notice when a nuisance or hazardous condition results, proceed to repair, rebuild, or otherwise restore such property as may be determined necessary, and the cost thereof will be deducted from any monies due or to become due the Contractor under his contract.

7.13 RESPONSIBILITY FOR DAMAGE CLAIMS (INDEMNIFICATION)

The Contractor shall defend, indemnify and save harmless the City and all its officers, agents (including the Engineer of Record), and employees from all suits, actions, or claims of any character, name and description including attorney's fees, expenses brought for or on account of any injuries or damages received or sustained by any person or persons or property, by or from the said Contractor or his employees or by or in consequence of any negligence in safeguarding the work of through the use of unacceptable materials in constructing the work, or by or on account of any act or omission, neglect or misconduct of the said Contractor, or by or on account of any claims of amounts recovered under the Workmen's Compensation Law or any other law, ordinance, order or decree, and so much of the money due the said Contractor under and by virtue of his contract as shall be considered necessary by the City may be retained for the use of the City, or in case no money is due, his sureties shall be held until suit or suits, action or actions, claim or claims for injury or damages as aforesaid shall have been settled and satisfactory evidence to the effect furnished the City. Contractor shall defend, indemnify and save harmless the City, its officers, agents (including the Engineer of Record), and employees in accordance with this indemnification clause regardless of whether the injury of damage is caused in part by the City, its officers, agents (including the Engineer of Record), or employees.

7.14 PUBLIC UTILITIES AND OTHER PROPERTY TO BE CHANGED

In case it is necessary to change or move the property of any owner or of a public utility, such property shall not be moved or interfered with until ordered to do so by the City Engineer. The right is reserved to the owner of public utilities to enter upon the limits of the contract for the purpose of making such changes or repairs of their property that may be necessary by performance of the contract. The City reserves the right of entering upon the limits of the contract for the purpose of repairing or relaying the sewer and water lines and appurtenances, repairing structures, etc., and making other repairs, changes, or extensions to any City property.

7.15 USE OF A SECTION OR PORTION OF THE WORK

Wherever in the opinion of the City Engineer any section or portion of the work or any structure is in suitable condition, it may be put into use upon the written order of the City Engineer, and such usage shall not be held to be in any way an acceptance of said work or

structure or any part thereof or as a waiver of any of the provisions of these specifications or the contract pending final completion and acceptance of the work; all necessary repairs and removals or any section of the work so put into use, due to defective materials or workmanship or to operations of the Contractor shall be performed by the Contractor at his own expense.

7.16 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

Until written acceptance by the City Engineer, as provided for in these specifications, the work shall be under the charge and care of the Contractor, and he shall take every necessary precaution to prevent injury or damage to the work or any part thereof by action of the elements or from any other cause whatsoever, whether arising from the execution or non-execution of the work.

7.17 NO WAIVER OF LEGAL RIGHTS

Inspection of any order, measurement, quantity, or certificate by the City Engineer, any order by the City for payment of money, any payment for or acceptance of any work, or any extension or time, or any possession taken by the City, shall not operate as a waiver of any provisions of the Contractor or any power therein reserved to the City of any rights or damages therein provided. Any waiver of any breach of Contract shall not be held to be a waiver of any other or subsequent breach. The City reserves the right to correct any error that may be discovered in any estimate that may have been paid and to adjust the same to meet the requirements of the contract and specifications. The City reserves the right to claim and recover by process of law sums as may be sufficient to correct any error or make good any deficiency in the work resulting from such error, dishonesty or collusion, upon the conclusive proof of collusion or dishonesty by the Contractor or his agents, discovered in the work after the final payment has been made.

7.18 CONTRACTOR'S INSURANCE

The contractor agrees to maintain the coverages, endorsements, and limits in accordance with and set forth by the Insurance Coverage & Limit Table below for the duration of this contract. The Contractor agrees to:

- Deliver to the City Certificate(s) of Insurance evidencing that such policies are in full force and effect not later than 5 business days after notification of the City's intent to award a contract, but in any event prior to commencement of work. If policy endorsements are necessary, satisfactory evidence of request to insurance carrier must accompany the Certificate(s) of Insurance. Failure to meet these requirements may cause the bid to be rejected.
- Submit any policy endorsements within 30 days of the City's intent to award contract. No payment will be made and/or the City may stop work or terminate the contract if contractor fails to supply satisfactory evidence of policy endorsements.
- Allow the City the right to obtain complete, certified copies of all required insurance policies at any time.
- Clearly indicate contract name and contract number to which Certificate(s), endorsements, and policies apply.

The requirements as to types and limits, as well as the City's review or acceptance of insurance coverage to be maintained by Contractor, is not intended to nor shall in any manner limit or qualify the liabilities and obligations assumed by the Contractor.

WORKERS' COMPENSATION INSURANCE & EMPLOYERS' LIABILITY INSURANCE – Statutory & $500,000/$500,000/$500,000 The Contractor agrees to maintain Worker's Compensation Insurance & Employers Liability. In the event any work is sublet, the Contractor shall require the subcontractor similarly to provide the same coverage and shall himself acquire evidence of such coverage on behalf of the subcontractor. Waiver of subrogation in favor of the City required. This requirement may be waived with satisfactory evidence that the Contractor is sole proprietor(s)/has no employees.

COMMERCIAL GENERAL LIABILITY INSURANCE – Limit of liability not less than $1,000,000 per occurrence Contractor agrees to maintain a standard ISO version Commercial General Liability occurrence form, or its equivalent providing coverage for, but not limited to, Bodily Injury and Property Damage, Premises/Operations, Products/Completed Operations, Independent Contractors. Additional insured endorsement required.

BUSINESS AUTOMOBILE LIABILITY INSURANCE – Limit of liability not less than $1,000,000 per occurrence Contractor agrees to maintain a standard ISO version Business Automobile Liability, or its equivalent, providing coverage for all owned, non-owned and hired automobiles. Should the Contractor not own any automobiles and furnish satisfactory evidence of this, the business auto liability requirement shall be amended to allow the Contractor to agree to maintain only Hired & Non-Owned Auto Liability. This amended coverage requirement may be satisfied by way of endorsement to the Commercial General Liability, or separate Business Auto policy.

UMBRELLA or EXCESS LIABILITY Contractors may satisfy the minimum liability limits required for Commercial General Liability and Business Auto Liability under an Umbrella or Excess Liability policy. The annual aggregate limit shall not be less than the highest "each occurrence" limit. Contractor agrees to endorse City as an additional insured, unless the Certificate states the Umbrella or Excess Liability provides coverage on a pure "True Follow Form" basis.

CONTRACTOR'S INSURANCE TO BE PRIMARY Contractor's insurance shall be deemed primary with respect to any insurance or self insurance carried by the City for liability arising out of operations under the contract.

DEDUCTIBLES, COINSURANCE PENALTIES, & SELF-INSURED RETENTION Contractor shall agree to be fully and solely responsible for any costs or expenses as a result of a coverage deductible, coinsurance penalty, or self-insured retention; including any loss not covered because of the operation of such deductible, coinsurance penalty, or self-insured retention.

RIGHT TO REVIEW AND ADJUST The City reserves the right to review these requirements and to modify insurance coverage and their limits when deemed necessary and

prudent. Furthermore, the City reserves the right, but not the obligation, to review and reject any insurer providing coverage because of poor financial condition.

SUBCONTRACTOR'S INSURANCE The Contractor shall agree to cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified, provided the Contractor's insurance does not afford coverage on behalf of the subcontractor.

CERTIFICATE OF INSURANCE Contractor shall furnish the City with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements. The certificate must be from a company with an A.M. Best rating of "A-VI" or better and/or otherwise acceptable to the City. Certificates must be submitted using the ACORD form and all endorsements must be included with the submittal. The certificate(s) shall contain a provision that coverage under such policies shall not be cancelled or non-renewed until at least thirty (30) days prior written notice, or ten (10) days notice for cancellation due to non-payment of premiums, is given the City of Bryan.

In the event the City is notified that a required insurance coverage will cancel or non-renew during the contract period, the Contractor shall agree to furnish prior to the expiration of such insurance, a new or revised certificate(s) as proof that equal and like coverage is in effect. The City reserves the right, but not the obligation, to withhold payment to Contractor until coverage is reinstated. If the Contractor fails to maintain the required insurance, the City shall have the right, but not the obligation, to purchase the required insurance at Contractor's expense.

Certificates and notices should be given to the City at the following address:

City of Bryan
Attn: Engineering Department
300 S. Texas Ave.
Bryan, TX 77803

INDEMNIFICATION:

The Contractor shall defend, indemnify and save harmless the City and all its officers, agents (including the Engineer of Record), and employees from all suits, actions, or claims of any character, name and description including attorney's fees expenses brought for or on account of any injuries or damages received or sustained by any person or persons or property, by or from the said Contractor or his employees or by or in consequence of any negligence in safeguarding the work, or through the use of unacceptable materials in construction of the work, or by or on account of any act or omission, neglect or misconduct of the said Contractor, or by or on account of any claims of amounts recovered under the Workmen's Compensation Law or any other law, ordinance, order or decree, and so much of the money due the said Contractor under and by virtue of this contract as shall be considered necessary by the City may be retained for the use of the City, or in case no money is due, his sureties shall be held until suit or suits, action or actions, claim or claims for injury or damages as aforesaid shall have been settled and satisfactory evidence to that effect furnished the City. Contractor shall defend, indemnify and save harmless the City, its officers, agents (including

the Engineer of Record), and employees in accordance with this indemnification clause regardless of whether the injury or damage is caused in part by the City, its officers, agents or employees.

7.19 ANTITRUST

Contractor hereby assigns to the City any and all claims for overcharges associated with this contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Sec. 1 et seq. (1973).

ITEM 8 - PROSECUTION AND PROGRESS

8.1 SUBLETTING THE WORK

If the Contractor sub-lets any part of the work to be done under this contract, he will not under any circumstances be relieved of his responsibility and obligations. All transactions of the City Engineer will be with the Contractor. Subcontractors will be considered only in the capacity of employees or workmen, and shall be subject to the same requirements as to character and competency. The City will not recognize any subcontractor on the work as having any binding authority relative to the contractual obligations of the Contractor. The Contractor shall at all times, when the work is in progress, be represented by a qualified designated representative. Contractor shall remove and replace subcontractors or workers if Contractor or City deem it necessary to prevent harm to workers, the work or City's property. The contractor shall provide the City with qualification statements from all subcontractors.

8.2 ASSIGNMENT OF CONTRACT

The Contractor shall not assign, transfer, convey or otherwise dispose of the contract or his rights, title or interest in or to the same, or any part thereof, without the previous consent of the City expressed by resolution of the City Council and concurred in by the sureties. If the Contractor does, without such previous consent, assign, transfer, convey or otherwise dispose of the contract or of his right, title or interest therein, or any part thereof to any person or persons, partnership, company, firm or corporation, or by bankruptcy, voluntary or involuntary, or by assignment under the insolvency laws, of any state, attempt to dispose of the contract or make default in or abandon said contract, then the contract may at the option of the City be revoked and annulled, unless the sureties shall successfully complete said contract, and any monies due or to become due under said contract shall be retained by the City as liquidated damages for the reason that it would be impracticable and extremely difficult to fix the actual damages.

8.3 PROSECUTION OF THE WORK

The Contractor shall begin the work to be performed under the contract within fifteen (15) calendar days after the date of the authorization to begin work and shall continuously prosecute same with such diligence as will enable him to complete the work within the time limit specified. He shall notify the City Engineer at least twenty-four (24) hours before beginning work at any point. He shall not open up work to the detriment of work already begun. The beginning, sequence, and prosecuting of the work shall be governed by the orders of the City Engineer, and the Contractor shall conduct his operations so as to impose a minimum interference to the public. The Contractor shall be required to attend construction progress meetings as scheduled by the City Engineer throughout the construction of this project. The City Engineer may require these meetings as often as necessary to facilitate communication and coordination between the owner and Contractor. Before the beginning of construction and at each progress meeting, the Contractor shall submit to the City Engineer a detailed construction and sequence schedule for review. The work plan shall be continually updated and detailed enough so that the City Engineer can determine potential effects on traffic, construction signing, and the overall project schedule.

8.4 LIMITATION OF OPERATIONS

The work shall be so conducted as to create a minimum amount of inconveniences to the public. At any time when in the judgment of the City Engineer the Contractor has obstructed or closes or is carrying on operations on a greater portion of the street or public way than is necessary for the proper execution of the work, the City Engineer may require the Contractor to finish the sections of work which is in progress before operations are started on any additional section.

8.5 CHARACTER OF WORKMEN AND EQUIPMENT

The Contractor shall employ such superintendents, foremen and workmen as are careful and competent, and the City Engineer may demand the dismissal of any person or persons employed by the contractor, in, about or on the work who shall misconduct himself or be incompetent or negligent in the proper performance of his or their duties or neglect or refuse to comply with the directions of the City Engineer, and such person or persons shall not be employed thereon again without the written consent of the City Engineer.

The Contractor shall furnish such equipment as is considered necessary for the prosecution of the work in an acceptable manner, and at a satisfactory rate of progress.

8.6 COMPUTATION OF CONTRACT TIME FOR COMPLETION

The Contractor shall complete the work within the number of working days or calendar days stated in the contract. For the purpose of computation, working days will begin on the date indicated in the written authorization by the City Engineer to proceed.

The City Engineer will furnish the Contractor a monthly statement on forms furnished by the City, showing number of working days charged during the month, total number of working days allowed in contract, and the working days remaining under the contract. The Contractor will be allowed ten (10) days in which to protest the correctness of the statement, otherwise the statement will stand. If the satisfactory completion of the contract shall require unforeseen work or work and materials in greater amounts or quantities than those set forth in the contract, then additional working days or suspension of time charge will be allowed the Contractor equal to the time which, in the opinion of the City Engineer, the work as a whole is delayed.

8.7 SUBSTANTIAL COMPLETION

The Contractor shall notify the City Engineer when, in the Contractor's opinion, the contract is Substantially Completed. Within ten (10) calendar days after the Contractor has given the City Engineer written notice that the work has been Substantially Completed, the City Engineer shall inspect the work for the preparation of a final punch list.

(a) If the City Engineer and the City find that the work is not Substantially Completed, then they shall so notify the Contractor who shall then complete the work. City Engineer shall not be required to provide a list of unfinished work.

(b) If the City Engineer and City find that the work is Substantially Completed, the City shall issue to the Contractor its certificate of Substantial Completion.

The Substantial Completion of the work shall not excuse the Contractor from performing all of the work undertaken, whether of a minor or major nature, and thereby completing the Project in accordance with the Contract Documents.

8.8 FINAL COMPLETION

The work shall reach Final Completion and be ready for final payment within **thirty (30) calendar days** from the date of Substantial Completion and shall notify the City Engineer. If the City Engineer and the City accept and deems such work Finally Complete, then Contractor shall be so notified and certificates of completion and acceptance, as provided herein, shall be issued. A complete itemized statement of this Agreement account, certified by the City Engineer as correct, shall then be prepared and delivered to Contractor. Contractor or City, as the case may be, shall pay the balance due as reflected by said statement within thirty (30) calendar days.

The Contractor shall procure all required certificates of acceptance or completions issued by state, municipal, or other authorities and submit the same to the City. The City may withhold any payments due under this Agreement until the necessary certificates are procured and delivered.

Neither the final payment nor any acceptance nor certificate nor any provision of this Agreement shall relieve the Contractor of any responsibility for faulty workmanship or materials. At the option of the City, the Contractor shall remedy any defects and pay for any damage to other work which may appear after final acceptance of the work.

8.9 FAILURE TO COMPLETE ON TIME

The time of completion is the essence of the contract. For each working or calendar day that any work shall remain uncompleted (including any remaining items of work 30 days beyond Substantial Completion) after the time specified in the Proposal and the Contract, or the increased time granted by the City, or as increased by work or materials ordered as provided in Section 8.6, the sum per day given in the following schedule, unless otherwise specified in the Special Provisions, will be deducted from the monies due the Contractor, not as a penalty but as administrative costs.

AMOUNT OF CONTRACT $ TO $	AMOUNT OF ADMINISTRATIVE COSTS PER DAY $
0 to 10,000	200
10,000 to 25,000	300
25,000 to 50,000	400
50,000 to 100,000	500
100,000 to 500,000	600
500,000 to 1,000,000	700
1,000,000 to 2,000,000	800
2,000,000 to _____	1000

The time for the Substantial and Final Completion of the work described herein are reasonable times for the completion of each, taking into consideration all conditions, including but not limited to the average climatic conditions and usual industrial conditions prevailing in this locality. The amount of administrative damages for the Contractor's failure to meet the deadlines for Substantial and/or Final Completion are fixed and agreed on by the Contractor because of the impracticability and extreme difficulty in fixing and ascertaining the actual damages that the City would in such an event sustain. The amounts to be charged are agreed to be damages the City would sustain and shall be retained by the City from current periodic estimates for payment or from final payment.

As a result of the difficulty in estimation, calculation and ascertainment of City's damages due to a failure of Contractor to achieve timely completion of the Work, if the Contractor should neglect, fail, or refuse to either Substantially Complete or Finally Complete the work within the time herein specified, or any proper extension thereof granted by the City Engineer, then the Contractor does hereby agree as part of the consideration for the awarding of this Agreement that the City may permanently withhold from the Contractor's total compensation the sum as shown on the table above for each and every calendar day that the Contractor shall be in default after the time stipulated for Substantial Completion and/or Final Completion, not as a penalty, but as administrative costs incurred by the City as a result of the Contractor's delay. It is specifically understood that the assessment of administrative costs may be made for any failure to meet either or both of the deadlines specified for Substantial Completion and/or Final Completion.

The sum of money thus deducted for such delay, failure or non-completion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable administrative costs, since it would be impracticable and extremely difficult to fix the actual losses incurred by the City as a result of the Contractor's delay.

8.10 SUSPENSION BY COURT ORDER

The Contractor shall suspend such part or parts of the work ordered by the Court, and will not be entitled to additional compensation by virtue of such court order. Neither will he be liable to the City in the event the work is suspended by such Court Order.

8.11 TEMPORARY SUSPENSION

The City Engineer shall have the authority to suspend the work wholly or in part for such period or periods as he may deem necessary due to unsuitable weather conditions or any other conditions as are considered unfavorable for the suitable prosecution of the work. If it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such manner that they will not obstruct or impede the public unnecessarily nor become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the work performed, he shall provide suitable drainage about the work and erect temporary structures where necessary. The Contractor shall not suspend work without written authority from the City Engineer, and shall proceed with the work promptly when notified by the City Engineer to resume operations. The "Time Charge" will be suspended during any such period of suspension.

8.12 SUSPENSION OF WORK AND ANNULMENT OF CONTRACT

The work or any portion of the work under contract shall be suspended immediately on written order of the City Engineer, a copy of such notice to be served on the Contractor's sureties, or the contract may be annulled by the City for any good cause or causes, among others of which special reference is made to the following:

(a) Failure of the Contractor to begin the work within the time specified.

(b) Substantial evidence that the progress of the work being made by the Contractor is insufficient to complete the work within the specified time.

(c) Failure of the Contractor to provide sufficient and proper equipment for properly executing the work.

(d) Substantial evidence that the Contractor has abandoned the work.

(e) Substantial evidence that the Contractor has become insolvent or bankrupt, or otherwise financially unable to carry on the work.

(f) Deliberate failure on the part of the Contractor to observe any requirements of these specifications or to comply with any orders given by the City Engineer as provided for in these specifications.

(g) Failure of the Contractor to promptly make good any defects in materials or workmanship, or any defects of any nature, the correction of which has been directed in writing by the City Engineer.

(h) Substantial evidence of collusion for the purpose of illegally obtaining a contract or perpetrating fraud on the City in the construction of work under contract.

When the work is suspended for any of the causes itemized above, or for any other cause or causes, the Contractor shall discontinue the work or such part thereof as the City shall designate, whereupon the sureties may at their option assume the contract or that portion thereof which the City has ordered the Contractor to discontinue, and may perform the same or may, with the written consent of the City, sub-let the work or that portion of the work so taken over, provided, however, that the sureties shall exercise their option within 15 days after the written notice to discontinue the work has been served upon the Contractor and upon the sureties or their agents. The sureties in such event shall assume the Contractor's place in all respects, and shall be paid by the City for all work performed by them in accordance with the terms of the contract. All monies remaining due the Contractor at the time of his default shall thereupon become due and payable to the sureties as the work progresses, subject to all terms of the contract. In case the sureties do not, within the herein above specified time, exercise their right and option to assume the contract or that portion thereof which the City has ordered the Contractor to discontinue, then the City shall have the power to complete by contract or otherwise, as it may determine, the work herein described or such part thereof as it may deem necessary, and the Contractor hereto agrees that the City shall have the right to take possession of and use any of the materials, plant, tools, equipment, supplies, and property of every kind provided by the Contractor for the purpose of this work and to procure other tools, equipment and materials for the completion of the same, and to charge to the account of the Contractor the expense of said contract for labor, materials, tools, equipment and expenses incident thereto. The expense so charged shall be deducted by the City out of such monies as may be due or may at any time thereafter become due the Contractor under and by virtue of the contract or any part thereof. The City shall not be required to obtain the lowest bid for the work of completing the contract, but the expenses to be deducted shall be the actual cost of such work. In case such expense is less than the sum which would have been payable under the contract if the same had been completed by the Contractor, then in such case the City may pay to the Contractor the difference in the cost, provided that the Contractor shall not be entitled to any claim for damages or for loss of anticipated profits. In case such expense shall exceed the amount which would have been payable under the contract if the same had been completed by the Contractor, then the Contractor and his sureties shall pay the amount of such excess to the City on notice from the City of the excess due. When any particular part of the work is being carried on by the City by contract or otherwise under the provisions of this section, the Contractor shall continue the remainder of the work in conformity with the terms of the contract, and in such manner as in no wise to hinder or interfere with the performance of workmen employed as above provided by the City.

8.13 TERMINATION OF CONTRACT

The contract will be considered fulfilled, save as provided in any maintenance stipulations, bond, or by law, when all work has been completed, the final inspection made by the City Engineer, and final acceptance and final payment made by the City.

ITEM 9 - MEASUREMENT AND PAYMENT

9.1 MEASUREMENT OF QUANTITIES

The determination of quantities of work acceptably completed under the terms of the contract, or as directed by the City Engineer in writing, will be made by the City Engineer, based on measurements made by the City Engineer. These measurements will be taken according to the U.S. Standard measurements used in common practice and will be the actual length, area, solid contents, numbers and weights.

9.2 SCOPE OF PAYMENT

The Contractor shall receive and accept the compensation, as herein provided, in full payment for furnishing all labor, tools, materials, equipment and incidentals; for performing all work contemplated and embraced under the contract; for all loss or damage arising out of the nature of the work, or from the action of the elements; for any unforeseen defects or obstruction which may arise or be encountered during the prosecution of the work, and before its final acceptance by the City Engineer; for all risks of whatever description connected with the prosecution of the work; for all expense incurred by or in consequence of suspension or discontinuance of such prosecution of the work as herein specified; for any infringement of patents, trademarks, or copyrights, and for completing the work in an acceptable manner according to the Plans and specifications. The payment of any current or partial estimate prior to final acceptance of the work by the City shall in no way constitute an acknowledgment of the acceptance of the work, nor in any way prejudice or affect the obligation of the Contractor to repair, correct, renew, or replace, at his own expense, any defects or imperfections in the construction, or in the strength or quality of the materials used in or about construction of the work under contract and its appurtenances nor any damage due or attributed to such defects, which defects, imperfections, or damage shall have been discovered on or before the final inspection and acceptance of the work. The City Engineer shall be the sole judge of such defects, imperfections, or damage, and the Contractor shall be liable to the City for failure to correct the same, as provided herein.

Any item of work not covered in the proposal will not be paid for directly, but shall be considered as subsidiary to a regular bid item.

9.3 PAYMENT FOR EXTRA WORK

The extra work done by the Contractor and authorized and approved by the City Engineer will be paid for in the manner hereinafter described and the compensation thus provided shall be accepted by the Contractor as payment in full for all labor, materials, tools, equipment and incidentals and all superintendents and timekeepers services, all insurance, bond and all other overhead expense incurred in the prosecution of the extra work. Payment for extra work will be made by one of the following methods:

(a) Method "A" - By unit prices agreed on in writing by the City Engineer and approved by the City before the said work is commenced, subject to all other conditions of said contract.

(b) Method "B" - By lump sum price agreed on in writing by the City Engineer and the Contractor and approved by the City before said extra work is commenced, subject to all other conditions of the contract.

For emergency field changes, the Contractor shall not proceed with any work that would require a Change Order to the contract without verbal approval, followed up by written approval of the City Engineer. The Contractor shall execute a project Change Order within one (1) working day of the Notice to Proceed with Emergency Work.

Under normal working conditions (non-emergency), the Contractor will not proceed with the required work identified in a Change Order until an approved Change Order is provided to the Contractor.

9.4 PARTIAL ESTIMATES

By the 5th day of each month, the Contractor will make an approximate estimate of the value of the work done during the month under these specifications and submit the estimate to the City Engineer for review. The City Engineer will review the payment request and an approved payment will be made by the 25th day of the same month. The partial estimate may include acceptable non-perishable materials delivered to the work for which one hundred percent (100%) or the net invoice will be allowed. The percent retained by the City will be ten percent (10%) on all partial estimates of the total amount of work completed. Five percent (5%) will be retained by the City on all partial estimates if the contract amount is four hundred thousand dollars ($400,000) or more. The Contractor shall furnish the City of Bryan such detailed information as requested to aid in evaluating partial estimates. It is understood that the partial monthly estimates and payments will be subject to review and correction by the City of Bryan of the estimate rendered following discovery of an error in the current and any previous estimate, and no such estimate shall in any respect be taken as an admission of the City of the amount of work done or of its quality of sufficiency nor as an acceptance of the work or the release of the Contractor of any of his responsibility under the contract. No partial or monthly estimates will be made on contracts with a value of less than twenty five thousand dollars ($25,000).

9.5 FINAL ACCEPTANCE

Whenever the improvement provided for by the contract shall have been completely performed on the part of the Contractor, the Contractor shall notify the City Engineer that the improvements are ready for final inspection. The City Engineer will then make such final inspection, and if the work is satisfactory and in accordance with the Specifications and Contract, he will give the Contractor a written Letter of Acceptance.

9.6 FINAL PAYMENT

Whenever the improvements provided for by the contract shall have been completely performed on the part of the Contractor as evidenced by the City Engineer in the Letter of Acceptance, a final estimate showing the value of the work will be prepared by the City Engineer as soon as the necessary measurements and computations can be made. All prior estimates upon which payments have been made are subject to necessary corrections or revisions in the final payment. The amount of this final estimate less any sums previously

paid under the provisions of the contract, will be paid the Contractor within thirty (30) days after final acceptance provided the Contractor has furnished the City satisfactory evidence that all sum of money due for any labor, materials, apparatus, fixtures, or machinery furnished for and used in the prosecution of the work, or that the person or persons to whom the same may respectively be due have consented to such final payment. The acceptance by the Contractor of the last payment as aforesaid shall operate as and shall release the City from all claims and liabilities under the contract or for any act or neglect of said City relating to or connected with the contract.

Prior to Final Payment, the Contractor shall provide a notarized affidavit stating that all bills for labor, materials, and supplies incurred have been paid in full, that any claims from manufacturers, suppliers, and subcontractors have been released, and that there are no claims pending of which the Contractor has been notified. Failure to do so will result in liquidated damages at a rate as specified in the Contract.

9.7 GUARANTEE OF WORK

The Contractor shall guarantee the work which he does against defective materials and workmanship for a period of one (1) year from the date of a letter of final acceptance by the City of Bryan, Texas. Should defective materials or workmanship occur, the Contractor shall have seven (7) working days, after written notice of same is given to him by the City of Bryan, Texas, to make any and all repairs at his own expense. If the Contractor fails to correct the defect within the seven (7) working days, then the City may make the necessary repairs and charge the Contractor with the actual cost of all labor, materials and equipment time required.

The Contractor shall have his Performance Bond to continue for one (1) year after final acceptance of the work to cover the guarantee as set forth above.

INSERT INSURANCE REQUIREMENTS AND CERTIFICATE OF INSURANCE PAGES HERE

C O N T R A C T

THE STATE OF TEXAS }
COUNTY OF BRAZOS }

THIS MEMORANDUM OF AGREEMENT this day made and entered into by and between the City of Bryan, a Municipal Corporation, and

_____
"Contractor",

W I T N E S S E T H

1.

That for the consideration hereinafter agreed to be paid by the City of Bryan, the said Contractor undertakes, covenants, and agrees to perform the work herein contracted to be done, in every detail conforming to the advertisement, proposal, specifications including special provisions, general provisions, plans or working drawings, and special agreements, on a certain public work described as:

_____
_____
_____
_____
_____ for the not to exceed sum of _____
_____. ($ _____)

2.

The Contractor hereby agrees to commence work under this Contract on a date to be specified in a work order of the City Engineer, and t working days thereafter. The Contractor further agrees to pay as administrative costs the sum of _____ for each consecutive calendar day used over and above the above mentioned work time.

3.

The City agrees that by the 5th day of each month the Contractor will make an approximate estimate of the value of the work done during the month under the Contract. Whenever the said estimates of work done since the last previous estimate exceeds $500.00 in amount, 90% of such estimated sum will be paid to the Contractor on or before the 25th day of the same month. When the contract amount is $400,000.00 or more, 95% of such estimated sum will be paid. The partial estimate may include acceptable, non-perishable materials delivered to the work. Such payment will be allowed on a basis of 100% of net invoice value. The Contractor shall furnish the City of Bryan such detailed information as may be requested to aid as a guide in evaluating partial estimates.

4.

It is further mutually agreed that should it appear to the City, or to the Engineer in charge that at any time during the existence of this Contract, the sureties on the said Contractor's bond have become insolvent, bankrupt, or otherwise financially unable to protect the City under the terms of the said Contract, the City may demand the said Contractor to furnish additional security in some approved surety company satisfactory to the City: the act of the City or the Engineer, with reference to demanding new or additional security, shall never be construed to relieve the original sureties of their obligation under the said Contract, or in any way to relieve the Contractor. The City may stop the said work under the Contract until additional security has been furnished by the said Contractor, and the City shall in no case be liable to the said Contractor on account thereof. The City may exercise its rights as provided in the attached specifications to take charge of the said work in the event of the refusal or failure of the Contractor to comply with the demands of the City with reference to furnishing additional security.

5.

That in consideration of the Contractor fully and faithfully complying with all the terms, provisions, and stipulations of this contract, the City of Bryan undertakes, covenants, and agrees to pay to the said Contractor for the furnishing of all material and labor, and the performance of the work herein contracted for the following sums or prices as shown by the attached proposal of bid of the Contractor, which said prices shall be the full compensation to be received by the said Contractor under the terms of this contract: Performable and enforceable in Brazos County, Texas.

IN TESTIMONY WHEREOF, the City of Bryan has caused this instrument to be signed in its corporate name, and on its behalf, by its Mayor thereof, attested by its City Secretary, with

its corporate seal affixed, and the said _____ _____thereby binding themselves, their heirs, successors, assigns, and representatives for the faithful and full performance of the terms and provisions of this contract, individually, jointly and severally.

EXECUTED in duplicate original this_____day of _____, 20____ , at Bryan, Texas, where this contract is performable and enforceable.

Party of the First Part
CITY OF BRYAN, TEXAS

Approved as to Form:

_____
Janis Hampton – City Attorney

Approved:

BY: _____
D. Mark Conlee - Mayor

Prepared and Recommended:

_____
W. Paul Kaspar, P.E. – City Engineer

Attest:

_____
Mary Lynne Stratta - City Secretary

Approved for Processing:

_____
Linda Grubbs Huff, P.E.
Director of Public Works

Party of the Second Part
(CONTRACTOR)

BY: _____
President

Attest:

_____
Witness

Approved for Council:

_____
David Watkins – City Manager

Bond No. _____

PERFORMANCE BOND

STATE OF TEXAS
COUNTY OF

KNOW ALL MEN BY THESE PRESENTS That _____ of the City of_____, County of _____, and State of , as principal, and _____authorized under the laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto the City of Bryan of Brazos County, Texas (Owner), in the penal sum of _____ _____($ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated the day _____ of _____ , 20___, to furnish all labor, materials and equipment necessary for completing _____

_____

_____

_____

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

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform said Contract and shall in all respects duly and faithfully observe and perform all and singular the covenants, conditions and agreements in and by said contract agreed and covenanted by the Principal to be observed and performed, and according to the true intent and meaning of said Contract and the Plans and the Specifications hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect;

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

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

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____ , 20 _____ .

_____	_____
Principal	Surety
By _____	Title _____
Title _____	Title _____
Address _____	Address _____
_____	_____

The name and address of the Resident Agent of Surety is:

_____

_____

Corporation Seal if Corporation.

Bonding Company Seal if Bonding Company.

Bond No. _____

PAYMENT BOND

STATE OF TEXAS
COUNTY OF

KNOW ALL MEN BY THESE PRESENTS That _____ of the City of _____ , County of _____ , and State of , as principal, and _____ authorized under the laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto the City of Bryan of Brazos County, Texas (Owner), in the penal sum of _____ _____ ($ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Owner, dated the _____ day of _____, 20_____, to furnish all labor, materials and equipment necessary for completing _____ _____ _____ _____

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

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

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

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

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____ , 20_____.

_____	_____
Principal	Surety
By _____	Title _____
_____	
Title _____	Title _____
Address _____	Address _____
_____	_____

The name and address of the Resident Agent of Surety is:

_____

_____

Corporation Seal if Corporation.

Bonding Company Seal if Bonding Company.

CONTRACTOR'S AFFIDAVIT OF BILLS PAID

STATE OF TEXAS §

COUNTY OF BRAZOS §

Personally, before me the undersigned authority, on this day appeared _____ , who being duly sworn, on oath, says that he is the legal representative of _____ _____and that Contract No._____ _____ for the construction of the project designated as _____ _____ has been completed in accordance with the Plans and Specifications and Contract Documents, and that all bills for materials, apparatus, fixtures, machinery, and labor used in connection with the construction of this project have, to the best of his knowledge and belief, been fully paid.

BY: _____
Representative for the Contractor

SWORN TO AND SUBSCRIBED BEFORE ME this the _____ day of , 20_____ .

_____

Notary Public in and for
Brazos County, Texas

(S E A L)

TECHNICAL SPECIFICATIONS

RENOVATION OF THE BRYAN CITY HALL ANNEX

700-ME-0102

SECTION 01 58 00

PROJECT IDENTIFICATION (CITY OF BRYAN ONLY)

PART 1 - GENERAL

1.1 REFERENCES

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

APWA C1	(2003) All Timber Products – Preservative Treatments by Pressure Processes
AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Processes

1.2 PROJECT IDENTIFICATION SIGNBOARD

A project identification signboard shall be provided in accordance with attached drawing. An image of indicating appearance of required signboard is provided in this specification section. The signboard shall be provided at a conspicuous location on the job site, city easement or right-of-way where directed by the City Engineer.

a. The field of the sign shall consist of a 4 by 8 foot sheet of grade B-B medium density overlaid exterior plywood.

b. Lumber shall be B or better Southern pine, pressure preservative treated in accordance with AWPA C1 and AWPA C2. Nails shall be aluminum or galvanized steel. The sign should be mounted using rectangular-timber signposts, No. 2 SYP or equivalent, 4x4 or 4x6. If 4x6 post is used, 1-1/2 inch weakening holes shall be drilled through the wide face at 4 and 18 inches above the ground. The wide face of the post shall be installed parallel with traffic. No more than 2 posts shall be mounted within a 7-foot span. The post shall be embedded into the ground a minimum of 36 inches. This support may be used in both weak and strong soils. The post may be directly embedded or may be embedded in premixed concrete, soilcrete, or approve expanding closed-cell polyurethane foam. (TxDOT Complaint Work Zone Traffic Control Devices J.2.b)

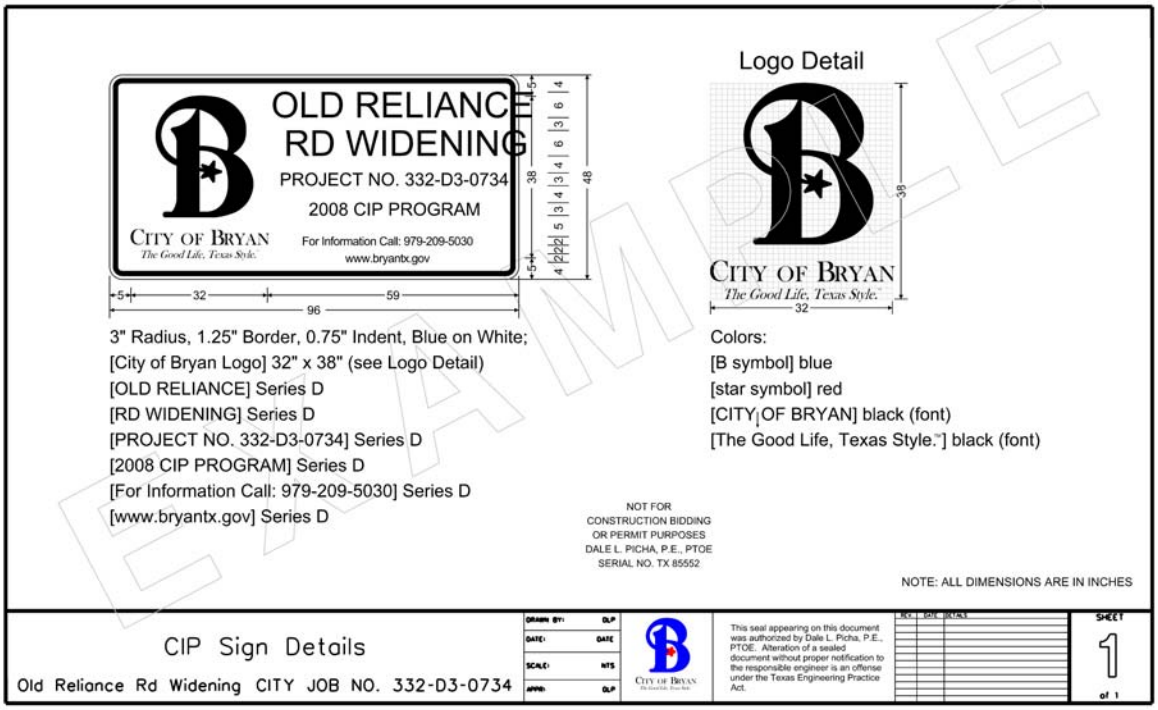
c. The entire signboard and supports shall be given one coat of exterior alkyd primer and two coats of exterior alkyd enamel paint. The lettering and sign work shall be performed by a skilled sign painter using paint known in the trade as bulletin colors. The colors, lettering sizes, and lettering styles shall be indicated by the City Engineer. Where preservative-treated lumber is required, utilize only cured pressure-treated wood which has had the chemicals leached from the surface of the wood prior to painting.

d. Use spray applied automotive quality high gloss acrylic enamel paint as background for the City of Bryan logo. The City of Bryan logo shall be an applied 2 millimeter film sticker/decal with background as indicated on image provided in this specification section. The weather resistant sticker/decal film shall be rated for a minimum of 2-year exterior vertical exposure. The self-adhering sticker shall be mounted to the sign with pressure sensitive, permanent acrylic adhesive.

e. Sign paint colors (manufacturer's numbers/types listed below for color identification only)

1) Blue = Pantone 661C
2) White = Bright White
3) Red = Pantone 485C

f. City of Bryan logo must retain proportions and design integrity. City of Bryan logos in electronic format may be obtained from the City of Bryan.



-

Example of Prescribed Image for CIP Project Identification Signs

SECTION 01100 – SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Bryan city Hall Annex. Project consists of renovating the former two story Police Station for new City offices.

1. Project Location: Intersection of 29th Street and South T exas Avenue, Bryan, Texas 77803
2. Owner: City of Bryan, 300 South Texas Avenue, Bryan, Texas 77803

B. Architect Identification: The Contract Documents, dated 6 April, 2010, were prepared for The City of Bryan by The Arkitex Studio, Inc., 308 N. Bryan Avenue, Bryan, Texas 77803, telephone 979-821-2635, contact person: Mike Record, AIA, Principal.

C. The Work consists of renovations to the interior of the existing building, including new walls, doors, ceilings, mechanical systems and electrical systems. It also includes replacing the existing windows with new metal stud walls with plaster finish and new aluminum storefront windows. New concrete ramps are also included in the scope of work.

1.3 CONTRACT

A. Project will be constructed under a general construction contract.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, within the limits of construction defined by the drawing.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. 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. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01210 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This 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 additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Testing and inspecting allowances.
2. Contingency allowance.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
2. Division 1 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
3. Divisions 2 through 16 Sections for items of Work covered by allowances.

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 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 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.

1.7 CONTINGENCY ALLOWANCE

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 overhead, profit, and related costs for products and equipment ordered by Owner 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 and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency 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.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Include Testing Allowance of $2000, as described in Division 1 Section "Quality Requirements."

B. Allowance No. 2: Include a lump sum allowance of $200,000 for contingency or for use at the Owner's discretion.

C. Total amount of allowances equals $202,000.

END OF SECTION 01210

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – Basement Renovation: Cost to remove all walls, doors, frames, cabinets, ceilings, floor finishes, mechanical, electrical and plumbing items as described on the drawings. Cost also to include complete build-out of the basement space including new floor, wall, and ceiling finishes, new lighting, electrical, and mechanical as described on the drawings. The base bid is to leave existing walls, doors, finishes, mep items, etc. as-is.

B. Alternate No. 2 – Resurface Fascia: Cost to clean, prepare and resurface existing precast concrete fascia with plaster finish on self furring metal lath. Refer to Section 09220 for Portland Cement Plaster specifications.

C. Alternate No. 3 – Relocate Transformer: Cost to disconnect and relocate existing transformer located in HR Badge Room #125 to Electrical Room #126. Cost to include re-routing existing and wiring to new location of transformer to maintain all circuits.

END OF SECTION 01230

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

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. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request 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 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.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.

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 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.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. 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 01250

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals 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. Correlate 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. Submittals Schedule.

   2. Submit the Schedule of Values to Architect at earliest possible date but no later than fourteen days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the 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 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. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.
      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. 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. Include evidence of insurance or bonded warehousing if stored off-site.
6. 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.
7. 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 shall be shown as a separate line item(s).
8. 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. Include change orders as a new line items, as needed.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   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: Applications for payment are due by the 5th day of each month. The date for each progress payment is on the tenth (25th) day of the same month. The period of construction Work covered by each Application for Payment is the period indicated therein.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Products list.
   5. Submittals Schedule (preliminary if not final).
   6. List of Contractor's staff assignments.
   7. List of Contractor's principal consultants.
   8. Copies of building permits.
   9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   10. Initial progress report.
   11. Report of preconstruction conference.
   12. Certificates of insurance and insurance policies.

G. Application for Payment at Substantial Completion: After receipt of 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 Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: 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 fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. Affidavit of All Bills Paid.
   5. AIA Document G707, "Consent of Surety to Final Payment."
   6. Evidence that claims have been settled.
   7. Final, liquidated damages settlement statement, if applicable.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various 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 with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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. Project closeout activities.

1.4 SUBMITTALS

A. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Schedule 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. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All 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. Tentative construction schedule.
b. Rain day procedures.
c. Critical work sequencing.
d. Designation of responsible personnel, including designated contacts for each entity.
e. Notification requirements for concrete pours, cover-ups, utility work.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for processing Applications for Payment.
h. Distribution of the Contract Documents.
i. Submittal procedures.
j. Preparation of Record Documents.
k. Use of the premises.
l. Responsibility for temporary facilities and controls.
m. Parking availability.

n. Office, work, and storage areas.
o. Equipment deliveries and priorities.
p. First aid.
q. Security.
r. Progress cleaning.
s. Working hours.

C. Progress Meetings: Conduct progress meetings once a month, at a time that is approved by Owner and Architect. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. 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.
b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

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.

1.6 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs:.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
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 Division 1 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

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.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at each progress meeting.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Special reports.

B. Related Sections include the following:
1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

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

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

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

E. Float: The measure of leeway in starting and completing an activity.

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

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

1.4 SUBMITTALS

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

B. Submittals Schedule: Submit four copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Submittal Number.
3. Specification Section number and title.
4. Submittal category (action or informational).
5. Name of subcontractor.
6. Description of the Work covered.
7. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit four printed copies.

D. Contractor's Construction Schedule: Submit four printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

E. Special Reports: Submit four copies at time of unusual event.

1.5 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, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those 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.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. A Gantt (bar) chart-type construction schedule is required. However, Critical Path Method (CPM) Construction Schedules are acceptable and may be used at the Contractor’s option.

C. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work Restrictions: Show the effect of the following items on the schedule:
   a. Uninterruptible services.
   b. Provisions for future construction.
   c. Seasonal variations.
   d. Environmental control.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Fabrication.
   e. Sample testing.
   f. Deliveries.
   g. Installation.
   h. Tests and inspections.
   i. Adjusting.
   j. Curing.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

G. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

   1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

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

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

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 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

   1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 5 percent increments within time bar.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day 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 Actual 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 01320

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals.
4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals. The Architect's action will be taken with such reasonable promptness as to cause no delay in the work.

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
3. If intermediate submittal is necessary, process it in same manner as initial submittal.
4. Allow 14 days for processing each resubmittal.
5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a. Project name and address.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

3. Transmittal Form: Provide locations on form for the following information:

    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category and type of submittal.
    g. Submittal purpose and description.
    h. Submittal and transmittal distribution record.
    i. Remarks.
    j. Signature of transmitter.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit five copies, unless copies are required for operation and maintenance manuals. Architect will retain one copy and consultant will retain one copy; remainder will be returned. Retain one returned copy as a Project Record Document

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Clearly mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operating and maintenance manuals.
    k. Compliance with recognized trade association standards.
    l. Compliance with recognized testing agency standards.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:

   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
4. Number of Copies: Submit one correctable, translucent, reproducible print and four blue- or black-line print of each submittal. Architect will return the reproducible print.

D. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
2. 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.
3. Samples for Verification: Where required, submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the 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.
4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

   a. Generic description of Sample.
   b. Product name or name of manufacturer.
   c. Sample source.

5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:

   a. Size limitations.
   b. Compliance with recognized standards.
   c. Availability.
   d. Delivery time.

6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

    a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
    b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

7. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
8. Number of Samples for Verification: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

    a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

9. 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.

E. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."

F. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized 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.
3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare 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.

K. Compatibility Test Reports: Prepare 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.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. 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.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.

7. Limitations of use.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Sections "Closeout Procedures" and "Operation and Maintenance Data."

P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

R. Manufacturer's Field Reports: Where required, prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service 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.

S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

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

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. “No exceptions taken”: no modifications are required before proceeding.

2. “Make corrections noted”: incorporate comments or corrections prior to proceeding with the work indicated. No re-submittal is required.

3. “Revise and resubmit”: Incorporate comments and corrections into the submittal and re-submit for review by the Architect.

4. “Rejected”: The submittal and/or product is not acceptable and does not comply with the requirements of the project documents.

C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting 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-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Refer to the end of this Section for a list of building code required Structural Tests and Special Inspections. These test are to be recorded and provided to the Owner at the completion of the Project.

C. Related Sections include the following:
1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

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 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design 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.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number 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. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, 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.

1.6 QUALITY ASSURANCE

A. 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.

B. 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.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, 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.

D. 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.

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 to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.7 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 the types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities:
1. Contractor shall provide nominal labor as necessary to assist the laboratory personnel in obtaining sample to be tested.
2. Contractor shall provide access to the work at all times for tests.

C. 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.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies 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 inspecting. 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 inspecting equipment at Project site.

G. 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 inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

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.

3.2 INTERNATIONAL BUILDING CODE – STRUCTURAL TESTS AND SPECIAL INSPECTIONS

The following certifications, certificates, tests and special inspections must be accomplished on this project per Section 1704.1.1 of the International Building Code:

Fabricator/Manufacturer Qualifications and Documentation

All fabricators and manufacturers for items listed below must provide written documentation demonstrating current certification with the required industry or trade organizations. Further, at the completion of the work all fabricators and manufacturers must provide a written certificate of compliance stating that the work was done in accordance with the approved construction documents for this project.

Structural Steel – Specification Section 05120,1.6,A

Structural Steel Joists – Specification Section 05210.1.6.A

Welder Qualifications and Documentation

All welders, shop and field, must have written documentation demonstrating current certification with AWS D1.1 for the type of welds they will be accomplishing.

Post Engineered Structural Assemblies and Components

All items designated to be designed by the General Contractor shall be documented by design calculations and shop drawings signed and certified by a Registered Professional Engineer licensed to practice in the State of Texas.

Manufactured Wood Trusses

Special Inspections – Soils and Foundations

Governing Criteria –utilize geotechnical engineering report prepared by CSC Engineering Inc. for material and construction requirements.

Subgrade preparation –	Periodic testing by Owner retained qualified testing laboratory per Specification Section 02300
	Continuous observations by General Contractor's Superintendent
Engineered fill -	Periodic testing by Owner retained qualified testing laboratory per Specification Section 02300
	Continuous observations by General Contractor's Superintendent

Special Inspections – Structural Reinforced Concrete

Reinforcing Steel Placement -	Periodic structural observations by Structural Engineer of Record

	Continuous observations by General Contractor's Superintendent
	Proper Design Mix Use - Periodic testing by Owner retained qualified testing laboratory per Specification Section 03300,3.15
Concrete Sampling -	Periodic testing by Owner retained qualified testing laboratory per Specification Section 03300,3.15
Concrete Placing -	Periodic observations by Owner retained qualified testing laboratory per Specification Section 03300,3.15
	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent
Concrete Curing -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent

<u>Special Inspections – Wood Frame Construction</u>

Material verification -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent
Roof truss framing -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent
Wood framing -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent

<u>Special Inspections – Structural Steel, Steel Joists and Steel Deck Construction</u>

Material verification -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent
High strength bolts -	Periodic observations by Owner retained qualified testing agency per Specification Section 05120,3.5
	Periodic structural observations by Structural Engineer of Record
Welding -	Periodic observations by Owner retained qualified testing agency per Specification Section 05120,3.5
	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent
Joint Details -	Periodic structural observations by Structural Engineer of Record
	Continuous observations by General Contractor's Superintendent

END OF SECTION 01400

SECTION 01420 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 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," "approved," "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": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "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.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. 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.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

E. Abbreviations and Acronyms for 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	 (800) 872-2253 (202) 272-5434
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	 (601) 634-2355
FED-STD	Federal Standard (See FS)	

FS	Federal Specification Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online	(215) 697-6257
	Available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
TAS	Texas Accessibility Standards Available from Texas Dept of Licensing & Regulation	

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 in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AAN	American Association of Nurserymen (See ANLA)	
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org	(202) 624-5800
ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118

AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee	(301) 972-1700
ANLA	American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen) www.anla.org	(202) 789-2900
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts www.aosaseed.com	(505) 522-1437
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
CCFSS	Center for Cold-Formed Steel Structures www.umr.edu/~ccfss	(573) 341-4471
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137

CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FSC	Forest Stewardship Council www.fscoax.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com/gana	(785) 271-0208
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
LMA	Laminating Materials Association (Formerly: ALA - American Laminators Association) www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
LSGA	Laminated Safety Glass Association (See GANA)	
MBMA	Metal Building Manufacturers Association	(216) 241-7333

	www.mbma.com	
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA)	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372
NGA	National Glass Association www.glass.org	(703) 442-4890
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400

NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association (Formerly: NSA - National Stone Association) www.nssga.org	(800) 342-1415 (703) 525-8788
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (508) 230-3516
PGI	PVC Geomembrane Institute //pgi-tp.ce.uiuc.edu	(217) 333-3929
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) www.ssma.com	(312) 456-5590
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 705-9898
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USITT	United States Institute for Theatre Technology, Inc. www.culturenet.ca/usitt	(800) 938-7488 (315) 463-6463

WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200

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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org	(909) 595-8449
ICBO	International Conference of Building Officials www.icbo.org	(800) 284-4406 (562) 699-0541
ICC	International Code Council, Inc. (Formerly: CABO - Council of American Building Officials) www.intlcode.org	(703) 931-4533

C. 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

TDLR Texas Department of Licenses and Regulation

TAS Texas Accessibility Standards

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01420

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Ventilation.
5. Electric power service.
6. Lighting.
7. Telephone service.

C. Support facilities include, but are not limited to, the following:

1. Temporary roads and paving.
2. Project identification and temporary signs.
3. Waste disposal facilities.
4. Field offices.
5. Storage and fabrication sheds.
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Stormwater control.
3. Security enclosure and lockup.
4. Barricades, warning signs, and lights.
5. Temporary enclosures.
6. Temporary partitions.
7. Fire protection.

E. Related Sections or drawings include the following:

1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
3. Division 2 Section "Cement Concrete Pavement" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

4. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner's construction forces.
2. Occupants of Project.
3. Architect.
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.

C. Water Service: Owner will ay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.

D. Electric Power Service: Owner will pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. 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. Comply with all regulations as set forth by the EPA Storm Water Discharge Program and file all necessary papers.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

C. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

D. Paint: Comply with requirements in Division 9 Section "Painting."

E. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

F. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Prefabricated Mobile units or Job-built construction with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

E. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

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.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. 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: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.

4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

1. Provide rubber hoses as necessary to serve Project site.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

   a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

1. Install electric power service underground, unless overhead service must be used.
2. Install power distribution wiring overhead and rise vertically where least exposed to damage.

H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

2. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

J. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.

1. Provide additional telephone lines for the following:
   a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.

2. At each telephone, post a list of important telephone numbers.

   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

3. Provide an answering machine or voice-mail service on superintendent's telephone.
4. Furnish superintendent with electronic paging device or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
2. Prepare temporary signs to provide directional information to construction personnel and visitors.
3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

D. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 8 persons at Project site. Keep office clean and orderly.

E. Storage and Fabrication Sheds: When necessary, provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Set fence posts in compacted mixture of gravel and earth.
2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
3. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. For safety barriers and similar uses, provide minimum 5/8-inch- thick exterior plywood.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.

3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

F. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.

   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 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. Protect from damage caused by freezing temperatures and similar elements.

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.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

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 the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. 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, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary General Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
1. Division 1 Section "References" for applicable industry standards for products specified.
2. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased 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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Completed List: Within 60 days after date of commencement of the Work, submit 4 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor after receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Requests must be made prior to bid as outlined below. 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. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. 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.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Architect will notify Contractor of acceptance or rejection of proposed substitution. All bidders will be notified of approved substitutions by addenda.
   a. Use product specified if Architect cannot make a decision on use of a proposed substitution before deadline.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "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, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

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. Comply with manufacturer's written instructions.

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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

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.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

2. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received **at least 7 days prior to bid opening**. Timing must allow for Architect to evaluate the proposed substitution, make changes in the documents (if approved), and publish approved items and resultant changes in an Addendum prior to bid. Requests received after that time may be considered or rejected at discretion of Architect.

B. 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:

1. 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.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. 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.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

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

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Starting and adjusting.
4. Protection of installed construction.
5. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting surveys.
3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. 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. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials more than 7 days during normal weather or 3 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.

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. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. 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.

J. 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.

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

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

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

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

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
6. Engineer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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.

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

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. 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.

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

3.3 PERFORMANCE

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

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. 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..

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to 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 Division 2 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.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

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

B. Related Sections include the following:

1. Division 1 Section "Summary" for use of premises and Owner-occupancy requirements.
2. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
3. Division 1 Section "Cutting and Patching" for cutting and patching procedures.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

A. Qualification Data: For demolition firm professional engineer.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials have been removed by Owner under a separate contract.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

   1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

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

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

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

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

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

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

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 1 Section "Construction Waste Management."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 01732

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Provisions and Requirements and Supplementary Provisions and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit four copies 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.
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.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain one set of blue- or black-line white prints of Contract Drawings and Shop Drawings. Submit this set plus one copy.

1. 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 prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Maintain one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Submit this set plus one copy.

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. Note related Change Orders, Record Drawings, and Product Data, where applicable.

D. Record Product Data and Shop Drawings: Submit one copy of each Product Data and Shop Drawing submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

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 Drawings, and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: 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.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

   a. Emergency instructions and procedures.
   b. System, subsystem, and equipment descriptions, including operating standards.
   c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
   d. Description of controls and sequence of operations.
   e. Piping diagrams.

2. Maintenance Data:

   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: When applicable, 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 the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

3.2 FINAL CLEANING

A. General: Provide 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 portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. 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.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 05400 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing curtain-wall framing.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As follows:

a. Dead Loads: Weights of materials and construction.
b. Live Loads Frame and Roof: 20 PSF
c. Wind Loads: U.L. Wind-Uplift Classification of 90 in accordance with Standard Building Code. Design wind pressure shall be 80 MPH. The design wind pressure acting upward shall be 80 MPH. Outward design wind pressures shall be 1.0/1.3 of this value.
d. Design Load Combinations:
1) Dead Load (DL) + Live Load (LL)
2) Dead Load (DL) + Wind Load (WL)

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/600 of the wall height.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1/2 inch.

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Welding Certificates: Copies of certificates for welding procedures and personnel.

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

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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

C. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing:

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.7 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. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Dietrich Industries, Inc.
2. ITEC Steel, Inc.
3. MarinoWare; Div. of Ware Industries, Inc.
4. Unimast, Inc.

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.
2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: .0.0428 inch (18 ga).
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0428 inch (18 ga).
2. Flange Width: 1-1/4 inches.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

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. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Hole reinforcing plates.
9. 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.

B. Anchor Bolts: ASTM F 1554, Grade 36, hot-dip process according to ASTM A 153/A 153M, Class C.

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: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations 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 welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten cold-formed metal framing members by welding at locations of dimensional stone.

5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

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

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

E. 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.

F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 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 top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. 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 curtain-wall-framing system.

3.4 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. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05721 - ORNAMENTAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel decorative railings.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Railings 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.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required.
1. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION AND SCHEDULING

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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

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. Steel Decorative Railings:

a. Newark Wire Works, Inc
b. McNichols Co.

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

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513. Square tubing with sharp edges.

B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Woven-Wire Mesh: 11 ga., 1 inch square mesh, rectangular panels clinched to 1 inch x 1/2 inch x .120 steel channel. Equal to Newark Wire Works Raining Infill Panels.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Shop Primers: Provide primers that comply with Division 9 painting Sections.

D. Intermediate Coats and Topcoats: Provide products that comply with Division 9 painting Sections.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. 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 will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Connections: Fabricate railings with welded connections unless otherwise indicated.

G. 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 Type 1 welds: no evidence of a welded joint.

H. Form changes in direction as follows:

1. As detailed.

I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

J. For railing posts set in concrete, provide 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.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

2.7 STEEL FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings after fabrication.
2. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
3. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. 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.

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.

3.2 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.

3.3 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

3.4 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.5 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 05721

SECTION 06100 - ROUGH CARPENTRY

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. Wood blocking and nailers.
2. Plywood backing panels.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber)] and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
   a. Chromated copper arsenate (CCA).
   b. Ammoniacal copper zinc arsenate (ACZA).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee 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, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. 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.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:
   1. Blocking.

2. Nailers.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2.5 PLYWOOD BACKING PANELS

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.

E. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

F. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

G. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

END OF SECTION 06100

SECTION 06160 - SHEATHING

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. Wall sheathing.
   2. Building Wrap
   3. Sheathing joint-and-penetration treatment.
   4. Flexible flashing at openings in sheathing (membrane flashing).

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 79/C 79M or ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. G-P Gypsum Corporation.
   b. National Gypsum Company.
   c. United States Gypsum Co.
2. Type and Thickness: Regular, 1/2 inch thick.
3. Edge and End Configuration: V-shaped, tongue-and-groove long edges; square ends.
4. Size: 24 by 96 inches for horizontal installation.

2.2 WEATHER-RESISTANT SHEATHING PAPER

A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
      b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
      c. Reemay, Inc.; Typar HouseWrap.

   2. Water-Vapor Permeance: Not less than 152 g through 1 sq. m of surface in 24 hours per ASTM E 96, Desiccant Method (Procedure A).
   3. Allowable UV Exposure Time: Not less than three months.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Division 7 Section "Joint Sealants."

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

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

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

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board 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 thick, attach sheathing to comply with ASTM C 954.

2.5 MISCELLANEOUS MATERIALS

A. Flexible Flashing (Membrane Flashing): Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      b. Grace Construction Products, a unit of W. R. Grace & Co. – Perm-A-Barrier Wall Flashing
      c. Heckmann Building Products, Inc; No. 82 Rubberized Asphalt Thru-wall Flashing
      d. Protecto Wrap, P.W. 100/40 Air/Vapor Barrier.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

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.

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. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall and roof 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 gap where non-load-bearing construction abuts structural elements.
   3. Install boards with a 1/4-inch 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 boards 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 o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
   2. Apply primer and rubberized asphalt tape to all joints and corners in gypsum sheathing at exterior walls in full compliance with manufacturer’s printed instructions.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

A. General: Cover sheathing with weather-resistant sheathing paper as follows:
   1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
   2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

B. Building Wrap: Comply with manufacturer's written instructions.
   1. Seal seams, edges, fasteners, and penetrations with tape.
   2. Extend into jambs of openings and seal corners with tape.

3.4 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

   1. Prime substrates as recommended by flashing manufacturer.
   2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
   3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
   4. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 06160

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

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. Interior standing and running trim.
2. Plastic-laminate cabinets.
3. Plastic-laminate countertop
4. Closet and utility shelving.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For panel products, high-pressure decorative laminate wood surfacing, adhesive for bonding plastic laminate cabinet hardware and accessories and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples for Initial Selection:

1. Plastic laminates.
2. Thermoset decorative panels.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.

E. Qualification Data: For Installer, fabricator.

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.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork 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 woodwork 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.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Formica Corporation.
b. Wilsonart International; Div. of Premark International, Inc.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware (Scheduled by Naming Products)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Pivot Hinges for glass doors.

E. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

F. Catches: Push-in magnetic catches, BHMA A156.9, B03131 at display case.

G. Shelf Rests: BHMA A156.9, B04013; metal.

H. Drawer Slides: BHMA A156.9, B05091; side mounted; full-extension type; epoxy-coated-steel with steel ball-bearings; of the following grades:

1. Box Drawer Slides: Grade 1.
2. File Drawer Slides: Grade 1HD-100.
3. Pencil Drawer Slides: : Grade 1; for drawers not more than 3 inches high and 24 inches wide.

I. Aluminum Slides for Sliding Glass Windows: BHMA A156.9, B07063.

J. Door Locks: BHMA A156.11, E07121.

K. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chrome Plated
2. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 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 nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives 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. Contact Adhesive: 250 g/L.

E. Adhesive for Bonding Plastic Laminate: Contact cement.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

D. 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.

E. 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.

1. Seal edges of openings in countertops with a coat of varnish.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH (Half wall cap)

A. Grade: Premium.

B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH (Window sills)

A. Grade: Premium.

B. Wood Species: Any closed-grain hardwood.

C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.7 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: PVC T-mold matching laminate in color, pattern, and finish.

D. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Wilsonart Laminate #7909-60 “Fusion Maple”

2.8 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Wilsonart Laminate #4882-38 ‘Oiled Soapstone’.

D. Edge Treatment: Same as laminate cladding on horizontal surfaces.

E. Core Material at Sinks: exterior-grade plywood.

F. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. 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 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, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

H. 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 sag, bow, or other variation from a straight line.
2. Secure backsplashes to walls with adhesive.
3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

J. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, 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 woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

Glass-fiber blanket insulation.

B. Related Sections include the following:

1. Division 15 Sections "Duct Insulation," "Equipment Insulation," and "Pipe Insulation."

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Glass-Fiber Insulation:

a. CertainTeed Corporation.
b. Johns Manville Corporation.
c. Knauf Fiber Glass.
d. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

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

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

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

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

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

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

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

3.4 INSTALLATION OF 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 where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.

3.6 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 07210

SECTION 07542 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Mechanically fastened PVC membrane roofing system.
   2. Vapor retarder.
   3. Roof insulation.

B. Section includes the installation of acoustical roof deck rib insulation strips furnished under Division 5 Section "Steel Deck."

C. Related Sections:
   1. Division 7 Section "Membrane Reroofing Preparation" for recover board beneath new membrane roofing.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 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.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

   1. Fire/Windstorm Classification: Class 1A-90.

1.5 ACTION SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Walkway pads or rolls.
4. Metal termination bars.
5. Six roof cover fasteners of each type, length, and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Field quality-control reports.

E. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed, FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

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

D. 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.

E. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance and certificates if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

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 CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PVC MEMBRANE ROOFING

A. PVC Sheet: ASTM D 4434, Type IV, fabric reinforced.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BondCote Corporation.
b. Duro-Last Roofing, Inc.
c. ERSystems.
d. IB Roof Systems.

2. Thickness: 40 mils, nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

C. Bonding Adhesive: Manufacturer's standard.

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

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

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

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer. Locate pads surrounding roof access hatch.

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. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

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.

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.

3.3 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.

1. Install sheet according to ASTM D 5082.

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

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

D. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.

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

F. In-Seam Attachment: Secure one edge of PVC sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten PVC sheet to roof deck.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

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

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.5 WALKWAY INSTALLATION

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

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect membrane 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 membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane 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.

3.8 ROOFING INSTALLER'S WARRANTY

A. WHEREAS Insert name of Insert address, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Insert name of Owner.
2. Address: Insert address.
3. Building Name/Type: Insert information.
4. Address: Insert address.
5. Area of Work: Insert information.
6. Acceptance Date: Insert date.
7. Warranty Period: Insert time.
8. Expiration Date: Insert date.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

   a. Lightning;
   b. Peak gust wind speed exceeding 90 mph;
   c. Fire;
   d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. Vapor condensation on bottom of roofing; and
   g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this Insert day day of Insert month, Insert year.

1. Authorized Signature: Insert signature.
2. Name: Insert name.
3. Title: Insert title.

END OF SECTION 07542

SECTION 07591 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof re-cover preparation.

B. Related Sections:

   1. Division 1 Section "Summary" for use of the premises and phasing requirements.
   2. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
   3. Division 15 Sections for HVAC equipment removal and reinstallation.
   4. Division 16 Sections for electrical equipment disconnection and reconnection.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System: Built-up asphalt roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.

C. Roof Re-Cover Preparation: Existing roofing membrane that is to remain and be prepared for reuse.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

E. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Fastener pull-out test report.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer of new membrane roofing system.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Reroofing Conference: Conduct conference at Project site.

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:

a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.
b. Temporary protection requirements for existing roofing system that is to remain during and after installation.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof drain plugging and plug removal requirements.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
e. Existing deck removal procedures and Owner notifications.
f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
g. Structural loading limitations of deck during reroofing.
h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
i. HVAC shutdown and sealing of air intakes.
j. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
k. Asbestos removal and discovery of asbestos-containing materials.
l. Governing regulations and requirements for insurance and certificates if applicable.
m. Existing conditions that may require notification of Architect before proceeding.

1.8 PROJECT CONDITIONS

A. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

B. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

C. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

D. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.

1. 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.

PART 2 - PRODUCTS

2.1 RECOVER BOARDS

A. Recover Board: Fan-folded, unfaced, extruded-polystyrene board insulation; 3/8-inch nominal thickness.

B. Fasteners: Factory-coated steel fasteners, No. 12 or 14, and metal or plastic plates listed in FM Approval's "Approval Guide," designed for fastening recover boards to deck.

2.2 AUXILIARY REROOFING MATERIALS

A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new membrane roofing system.

B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "Approval Guide."

C. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

B. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

C. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF RE-COVER PREPARATION

A. Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing membrane that inhibit new recover boards from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing with a power broom.
2. Broom clean existing substrate.
3. Verify that existing substrate is dry before proceeding with installation. Spot check substrates with an electrical capacitance moisture-detection meter.
4. Remove materials that are wet and damp. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

B. Remove blisters and areas of membrane not fully adhered.

3.3 EXISTING BASE FLASHINGS

A. Remove existing base flashings around parapets, curbs, walls, and penetrations.

1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

3.4 FASTENER PULL-OUT TESTING

A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Architect before installing new membrane roofing system.

1. Obtain Architect's approval to proceed with specified fastening pattern. Architect may furnish revised fastening pattern commensurate with pull-out test results.

3.5 RECOVER BOARD INSTALLATION

A. Install recover boards over roofing membrane with long joints in continuous straight lines and end joints staggered between rows. Loosely butt recover boards together.

3.6 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 07591

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

B. Related Sections:
1. Division 8 Section "Glazing" for glazing sealants.
2. Division 9 Section "Ceramic Tile" for sealing tile joints.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

E. Field-Adhesion Test Reports: For each sealant application tested.

F. Warranties: Sample of special warranties.

1.6 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.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by 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. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. 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.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

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

a. Dow Corning Corporation; 790.
b. May National Associates, Inc.; Bondaflex Sil 728 NS.
c. Pecora Corporation; 301 NS or 311 NS.
d. Tremco Incorporated; Spectrem 800.

B. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.

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

a. Dow Corning Corporation; 890-SL.
b. May National Associates, Inc.; Bondaflex Sil 728 SG or Sil 728 SL.
c. Pecora Corporation; 300 SL or 310 SL.
d. Tremco Incorporated; Spectrem 900 SL.

C. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

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. Pecora Corporation; 898.

2.3 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

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

a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240 or Dymeric 240 FC.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20+.

d. Schnee-Morehead, Inc.; SM 8200.
e. Tremco Incorporated; Tremflex 834.

2.5 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.

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

a. Pecora Corporation; AC-20 FTR or AIS-919.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting 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.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile 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.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. 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. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint

substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Control and expansion joints in brick pavers.
   b. Isolation and contraction joints in cast-in-place concrete slabs.
   c. Joints between plant-precast architectural concrete paving units.
   d. Joints in stone paving units, including steps.
   e. Tile control and expansion joints.
   f. Joints between different materials listed above.
   g. Other joints as indicated.

2. Silicone Joint Sealant: Single component, pourable, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.

b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.
e. Joints in glass unit masonry assemblies.
f. Joints in exterior insulation and finish systems.
g. Joints between metal panels.
h. Joints between different materials listed above.
i. Perimeter joints between materials listed above and frames of doors windows and louvers.
j. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, nonsag,, Class 50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls and partitions.
e. Joints on underside of plant-precast structural concrete beams and planks.
f. Perimeter joints between interior wall surfaces and frames of interior doors windows.
g. Other joints as indicated.

2. Joint Sealant: Acrylic based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

    a. Acoustical joints where indicated.
    b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07920

SECTION 08111 - STANDARD STEEL 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections include the following:
1. Division 8 Section "Glazing" for glazed lites in standard steel doors.
2. Division 8 Sections for door hardware for standard steel doors.
3. Division 9 painting Sections for field painting standard steel doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Details of glazing frames and stops showing glazing.

C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

F. Oversize Construction Certification: For standard steel door assemblies required to be fire rated and exceeding limitations of labeled assemblies; include statement that doors comply with requirements of design, materials, and construction but have not been subjected to fire test.

G. Qualification Data: For Installer.

H. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. 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 masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an ASSA ABLOY Group Company.
3. Deansteel Manufacturing, Inc.
4. Pioneer Industries, Inc.
5. Republic Builders Products Company.
6. Steelcraft; an Ingersoll-Rand 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 A40 zinc-iron-alloy (galvannealed) coating designation.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.

D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: Comply with ASTM C 476, with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel as indicated on Drawings.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
3. Vertical Edges for Single-Acting Doors: Square edge.

4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model1 (Full Flush)

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.5 FABRICATION

A. General: Fabricate standard steel doors and frames 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
3. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   1) Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.6 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

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

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

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 standard steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Install frames with removable glazing stops located on secure side of opening.
   b. Install door silencers in frames before grouting.
   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   d. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   e. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
4. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel 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 standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 08111

SECTION 08125 - INTERIOR ALUMINUM FRAMES

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. Interior aluminum frames for doors.
2. Interior aluminum frames for glazing.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for carpentry for wood framing and blocking.
2. Division 7 Section "Joint Sealants" for joint sealants installed with interior aluminum frames and for sealants to the extent not specified in this Section.
3. Division 8 Section "Flush Wood Doors" for wood doors installed in interior aluminum frames.
4. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for aluminum-framed doors installed in interior aluminum frames.
5. Division 8 Section "Door Hardware" for door hardware.
6. Division 8 Section "Glazing" for glass in interior aluminum frames.
7. Division 9 Section "Gypsum Board Assemblies" for partitions.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of interior aluminum frame indicated.

B. Shop Drawings: For interior aluminum frames. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: 12-inch-long framing member with factory-applied finish for each type of interior aluminum frame indicated.

D. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1.5 WARRANTY

A. Warrant against defects in manufacturing of materials for a period of 2 years from date of substantial completion.

B. Warrant framing finish against defects, including cracking, flaking, blistering, peeling, and excessive fading, chalking and non-uniformity in color for a period of 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for interior aluminum frames is based on RACO Solutions II with 3/8 inch by 1 1/2 inch trim. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Modulex, Inc.
2. Wilson Partitions.

2.2 COMPONENTS

A. Aluminum Framing, General: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than 0.062 inch thick.

B. Door Frames: Reinforced for hinges and strikes.

C. Glazing Frames: For glazing thickness indicated.

D. Ceiling Tracks: Extruded aluminum.

E. Trim: Extruded aluminum, not less than 0.062 inch thick, with removable snap-in glazing stops and doorstops without exposed fasteners.

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic stainless-steel or other non corrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated.

C. Glazing: Comply with requirements in Division 8 Section "Glazing."

D. Hardware: Comply with requirements in Division 8 door hardware Sections.

2.4 FABRICATION

A. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

B. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.

C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

D. Fabricate all components to allow secure installation without exposed fasteners.

2.5 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of work.

1. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with frame manufacturer's written installation instructions.

B. Install frames plumb and square, securely anchored to substrates.

C. Install frame components in the longest possible lengths; components up to 96 inches long must be 1 piece.

3.3 CLEANING

A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

B. Touch up marred frame surfaces. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 08125

SECTION 08211 - FLUSH WOOD DOORS

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. Solid-core doors with plastic-laminate faces.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings.

B. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Plastic-Laminate Door Faces: Show the full range of colors, textures, and patterns available.

C. Samples for Verification:

1. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
2. Corner sections of plastic-laminate-clad doors, approximately 8 by 10 inches

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Wood Doors:

a. Algoma Hardwoods Inc.
b. Buell Door Company.
c. Eggers Industries; Architectural Door Division.
d. Weyerhaeuser Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Plastic-Laminate-Faced Doors:

1. Grade: Custom.
2. Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: Wilsonart Laminate 10745-60 “Fonthill Pear”
4. Stiles: 3/4” Thick Hardwood edges for staining to match faces.

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:

a. 5-inch top-rail blocking, in doors indicated to have closers.
b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
c. 5-inch midrail blocking, in doors indicated to have exit devices.

B. Interior Plastic-Laminate-Faced Doors:

1. Core: Particleboard.
2. Construction: Three plies with stiles and rails bonded to core, then entire unit abrasive planed before faces are applied.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or 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 08211

SECTION 08411 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior aluminum-framed storefronts.

    a. Glazing is retained mechanically with gaskets on four sides.

2. Exterior and interior manual-swing aluminum doors.

3. Exterior aluminum door frames.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
2. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
3. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.
4. Division 8 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferred to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    d. Glazing-to-glazing contact.
    e. Noise or vibration created by wind and thermal and structural movements.
    f. Loosening or weakening of fasteners, attachments, and other components.
    g. Sealant failure.
    h. Failure of operating units to function properly.

B. Structural Loads:

1. Wind Loads: 25 lb/sf

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. Test Durations: As required by design wind velocity but not less than 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..

F. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

1.4 SUBMITTALS

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

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

F. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

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.

C. Accessible Entrances: Comply with Texas Accessibility Standards.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water leakage through fixed glazing and framing areas.
e. Failure of operating components to function properly.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for aluminum-framed systems is based on Vistawall Architectural Product Series 3000, thermal center glazed. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Exterior

a. United States Aluminum.
b. Kawneer.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

2. Door Design: Wide stile; 5-inch nominal width.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets for 1” insulated glass infill at exterior doors and 1/4” infill at interior doors.

4. Interior Aluminum Doors
   a. Basis of design: Raco Series 550 Interior Aluminum doors with 6 inch wide mullion. Hardware for these doors specified in Section 08711.
   b. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
      1) Modulex, Inc.
      2) Wilson Partitions.

2.6 DOOR HARDWARE

A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.

1. Opening-Force Requirements:

   a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.

B. Scheduled Door Hardware: Provide door hardware according to the Door Hardware Schedule at the end of Part 3 for exterior doors.

1. Named Manufacturer's Products: Product designation and hardware manufacturer are listed in the Door Hardware Schedule at the end of Part 3 to establish minimum requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware.
    a. Named products are basis-of-design products. Provide named hardware manufacturer's products or comparable products that are equivalent in function and quality and that are recommended and supplied by entrance system manufacturer as allowed per section 08711.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 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 thickness per coat.

2.8 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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 fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring 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 from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

G. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

3.5 DOOR HARDWARE SETS

Hardware Set 1 (Exterior aluminum storefront)
Doors 100A, to have the following:

	Mfg.	**Description**	**Finish**
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US32D
Exit Device (active leaf)	Von Duprin	98L-NL w/ 07 lever	628
Exit Device (inactive leaf)	Von Duprin	98EO	628
Electric Strike (active leaf)	Von Duprin	6111 DS-LC AL	
Strike (inactive leaf)	Von Duprin	299 AL	
Removable Mullion (electric)	Von Duprin	4854-KR	SP28
Closer	Hager	5001 PAR ALM	ALUM

Access Reader	HID	MiniProx Reader
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike
Threshold	NGP	713
Weather stripping		Manufacturers standard
Sweep		Manufacturers standard

Hardware Set 2 (Exterior aluminum storefront)

Doors 100B, 101, 117, 001A, to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US32D
Lockset	Falcon	T581A	626
Closer	Hager	5001 PAR ALM	ALUM
Electric Strike	VD	6211 AL	
Access Reader	HID	MiniProx Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	
Threshold	NGP	713 (513 at door 001A)	
Weather stripping		Manufacturers standard	
Sweep		Manufacturers standard	

END OF SECTION 08411

SECTION 08711 - DOOR HARDWARE (SCHEDULED BY NAMING PRODUCTS)

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. Commercial door hardware for the following:
   a. Swinging doors.
2. Cylinders for doors specified in other Sections.

B. Related Sections include the following:

1. Division 8 Section "Aluminum Entrances and Storefronts" for exterior entrance door hardware, except cylinders.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Texas Accessibility Standards as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to Owner by hand delivery.

1.6 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. General Warranty: Special warranties 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.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for Electromagnetic, Delayed-Egress Locks: Five years from date of Substantial Completion.

E. Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.2 HINGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hinges:

a. Hager Companies (HAG).
b. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
c. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

B. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

C. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mechanical Locks and Latches: Basis of design is Falcon T Series extra heavy duty, Grade 1, Cylindrical lever locks. Alternate manufactures listed below with comparable products may be considered:
   a. Hager Companies
   b. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.

2. Electromagnetic Locks and Latches:
   a. Locknetics Security Engineering; a Harrow Company (LSE).
   b. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
   c. Securitron Magnalock Corp. (SMC).
   d. Security Door Controls (SDC).
   e. Von Duprin, Inc.; an Ingersoll-Rand Company (VD).
   f. Yale Security Inc.; Div. of Williams Holdings (YAL).
   g. Dorma Architectural Hardware (DOR)

B. Certified Products: Provide door hardware listed in the following BHMA directories:

1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."

C. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:

1. Cylindrical Locks: BHMA A156.2, Series 4000, Grade 1.

D. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
3. Deadbolts: Minimum 1-inch bolt throw.

E. Backset: 2-3/4 inches, unless otherwise indicated.

F. Electric access and card readers: Provide card readers by HID Global. Coordinate with Owners existing system format and access control system. Power supply boxes provided by hardware supplier to coordinate with electric strikes.

2.4 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Bolts:
   a. Adams Rite Manufacturing Co. (ARM).
   b. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
   c. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
   d. Triangle Brass Manufacturing Company, Inc. (TBM).

2.5 CYLINDERS AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cylinders Falcon. A23161-05 with interchangeable core C606 to match Owners existing keying system.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.
2. Cylindrical Type: Cylinders with tailpieces to suit locks.

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key, and usable with other manufacturers' cylinders.

D. Construction Keying: Comply with the following:

1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

a. Replace construction cores with permanent cores, as directed by Owner.

E. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:

1. Master Key System: Cylinders are operated by a change key and a master key.
2. Coordinate Master Key system with Owners keying system.

F. Keys: Provide nickel-silver keys complying with the following:
1. Stamping: Permanently inscribe each key with a visual key control number and consecutively numbered keys with identical cuts.

2. Quantity: In addition to two extra blank key for each lock (door), provide the following:

a. Cylinder Change Keys: Three.
b. Master Keys: Five.

2.6 STRIKES

A. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Dustproof Strikes: BHMA A156.16.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

C. Dustproof Strikes: BHMA Grade 1.

D. Electric Strikes: BHMA Grade 1
   1. Provide latch position switch for each electric strike.

2.7 OPERATING TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trimco
   2. Rockwood Manufacturing Company

2.8 CLOSERS

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. Surface-Mounted Closers:
      a. Hager Companies
      b. LCN Closers; an Ingersoll-Rand Company (LCN).
      c. Norton Door Controls; Div. of Yale Security Inc. (NDC).
      d. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).

C. Surface Closers: BHMA Grade 1

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.9 STOPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trimco
   2. Rockwood Manufacturing Company

B. Standards: Comply with the following:
   1. Stops and Bumpers: BHMA A156.16.
   2. Mechanical Door Holders: BHMA A156.16.
   3. Combination Overhead Holders and Stops: BHMA A156.8.
   4. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Grade 1, unless Grade 2 is indicated.

D. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

2.10 THRESHOLDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. National Guard Products, Inc. (NGP).
2. Pemko Manufacturing Co., Inc. (PEM).
3. Zero International, Inc. (ZRO).

2.11 FABRICATION

A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.
b. Strike plates to frames.
c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:

a. Surface hinges to doors.
b. Closers to doors and frames.
c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.

5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.12 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. BHMA Designations: Comply with base material and finish requirements indicated by the following:

1. BHMA 600: Primed for painting, over steel base metal.
2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
3. BHMA 630: Satin stainless steel, over stainless steel base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
2. Power supply boxes to be circuited from HVAC and access control cabinets located in Communication Room 021 and Data 129. Control cabinets connected to UPS.
3. Provide separate overcurrent device for each door.
4. Power supply boxes to be furnished by door hardware supplier ad installed by access control contractor.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SETS: Note: Provide new cylinders on all existing doors to remain.

Hardware Set 3 (Interior Office)
Doors 102, 105, 106, 108, 109, 111, 115, 116, 119, 121, 122, 123, 124, 125, 134, 135, 136, 138, 139, 141, 143, 144, 146, 147, 150, 153, 154, 155; each to have the following:

	Mfg.	**Description**	**Finish**
Butt Hinge	Hager	BB1279 x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T511A	626
Floor stop	Focal	7280	US26D

Hardware Set 4 (Interior Storage)
Doors 104, 107, 120, 126, 129, 131, 145, 149B, 149C; to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1279 x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Floor stop	Focal	7280	US26D

Hardware Set 5 (Interior Entry)
Door 118, to have the following :

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 ALM	
Access Reader	HID	MiniProx Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 6 (Interior, privacy)
Door 127; to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1279 x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T301A	626
Floor stop	Focal	7280	US26D
Kick plate	Trimco	50050 alum	Kick plate

Hardware Set 7 (Interior, push/pull)
Doors 128, 006, 010; each to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US26D
Push/Pull	Focal	7141 pull/7001 pull	626
Closer	Hager	5100 PAR ALM	
Floor stop	Focal	7280	US26D
Kick plate	Trimco	50050 alum	

Hardware Set 8 (Interior, storage)
Door148A; to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 ALM	
Access readers (2)	HID	MiniProx Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 9 (Interior passage)

Pair of Doors 149A, 005A; each to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US26D
Lockset (active leaf)	Falcon	T101A	626
Closer (active leaf)	Hager	5100 PAR AL (regular arm at door 149A)	
Flush bolts (inactive leaf)	GJ	FB 6x36 head, FB 6x12 sill	
Floor stop	Focal	7280	US26D

Hardware Set 10 (Interior, office, existing)

Doors 201, 202, 205, 206, 207; each to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Lockset	Falcon	T511A	626

Hardware Set 11 (Interior, storage)

Door 151 to have the following:

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5001 PAR ALM	ALUM
Access reader	HID	ProProx II Reader	
Power supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 12 (Interior, privacy, existing)

Door 203; to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Lockset	Falcon	T301A	626

Hardware Set 13 (Interior, storage, existing)

Doors 204, 002, 003, 009, 019, 020, 021, 022A; each to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Lockset	Falcon	T581A	626

Hardware Set 14 (Interior, office, existing)

Doors 015, 016, 017; each to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Lockset	Falcon	T511A	626

Hardware Set 15 (Interior, passage, existing)

Door 140B; to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Lockset	Falcon	T101A	626

Hardware Set 16 (Exterior, entry)

Door 018; to have the following: Remaining hardware is existing

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168 4 1/2 x 4 1/2	US32D
Lockset	Falcon	T581A	626
Electric strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 PAR ALM	
Access reader	HID	ProProx II Reader	
Power supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	
Threshold	NGP	513	
Weather stripping	NGP	110 NA	
Sweep	NGP	202 NA	

Hardware Set 17 (Interior Entry)

Doors 130, 001B each to have the following :

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 PAR ALM	
Access Reader	HID	ProProx II Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 18 (Interior Entry)

Doors 132A, 132B each to have the following :

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 PAR ALM	
Access Reader	HID	MiniProx Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 19 (Interior Entry)

Door 014 to have the following :

	Mfg.	Description	Finish
Butt Hinge	Hager	BB1168x 4 1/2 x 4 1/2	US26D
Lockset	Falcon	T581A	626
Electric Strike	VD	6211 DS-LC AL	US32D
Closer	Hager	5100 ALM	
Access Reader	HID	ProProx II Reader	
Power Supply		Manufacturer's recommended low voltage power supply. Coordinate with strike	

Hardware Set 20 (Interior, push/pull)

Doors 112, 113; each to have the following:

	Mfg.	Description	Finish
Push/Pull	Focal	7141 pull/7001 pull	626
Kick plate	Trimco	50050 alum (match existing size)	

END OF SECTION 08710

SECTION 08800 - GLAZING

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.
2. Glazed entrances.
3. Interior side lites.
4. Storefront framing.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: 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 that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the

following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: 25 lb/sf, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

1) For monolithic-glass lites heat-treated to resist wind loads.
2) For insulating glass.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick of thickness indicated.
2. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch- wide interspace.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch-long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

C. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Each color of tinted float glass.
2. Insulating glass for each designation indicated.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

E. Qualification Data: For installers.

F. Product Test Reports: For each of the following types of glazing products:

1. Tinted float glass.
2. Coated float glass.
3. Insulating glass.

G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

F. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials; for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

G. 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 Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 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.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, 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. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

D. Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.

E. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Tint Color: Gray.

2. Visible Light Transmittance: 44 percent minimum.

F. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

2.4 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 with a Shore, Type A durometer 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).

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze 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 in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.6 INSULATING-GLASS UNITS

A. Low-E Coated, clear Insulating-Glass Units:

1. Basis-of-Design Product: PPG Industries Solargray + Sungate 500 Low-E glass or a comparable product by one of the following:

a. Guardian
b. Interpane
c. Pilkington
d. Visteon
e. Viracon

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.

3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (gray) float glass.
   a. Annealed and Kind HS (heat strengthened where required).
5. Indoor Lite: Class 1 (clear) float glass.
   a. Annealed and Kind FT (fully tempered where indicated).
6. Low-E Coating: Sputtered on third surface.
7. Visible Light Transmittance: 37 percent minimum.
8. Summer Daytime U-Factor: 0.35 maximum.
9. Solar Heat Gain Coefficient: 0.40 maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, 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 system.
3. Minimum required face or 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.

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. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

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 sealant-substrate 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 as follows:

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 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. 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.

K. 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. Fabricate compression gaskets in 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. 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 weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. 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, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended 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 08800

SECTION 08830 - MIRRORS

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 types of silvered flat glass mirrors.

1. Annealed monolithic glass mirrors.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
2. Division 10 Section "Toilet and Bath Accessories" for metal-framed mirrors.

1.3 DEFINITIONS

A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
2. Mirror mastic.
3. Mirror hardware.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

D. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.

B. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.

C. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

D. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRROR MATERIALS

A. Clear Glass Mirrors: ASTM C 1503, Mirror Select Quality.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch in height, respectively.
2. Top Trim: Formed with front leg with a height of 5/16 inch and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.
3. Product: Subject to compliance with requirements, provide the following:

a. Bottom Trim: C. R. Laurence Co., Inc.; D638 FHA Type "J" Channel.
b. Top Trim: C. R. Laurence Co., Inc.; D 1638 Top Channel.
c. Cleat: C. R. Laurence Co., Inc.; D 1637M Mirror Mount System Cleat.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Mirror Edge Treatment: Flat polished edge.

1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. For wall-mounted mirrors, install mirrors with mastic and mirror hardware.

1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
2. For mirror hardware in the form of continuous J-channels at bottom, provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, 2 slotted weeps not less than 1/4 inch wide by 3/8 inch long.
3. For mirror hardware in the form of a continuous J-channel at bottom and continuous top trim at top, fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
4. Where indicated, install mirror hardware in the form of J-channels that are fabricated in single lengths to fit and cover top and bottom edges of mirrors.
5. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08830

SECTION 08911 - GLAZED ALUMINUM CURTAIN WALLS

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 conventionally glazed aluminum curtain walls installed as stick systems.

B. Related Sections include the following:
1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
2. Division 8 Section "Aluminum Entrances and Storefronts" for entrance and storefront systems installed with glazed aluminum curtain-wall systems.
3. Division 8 Section "Glazing" for insulating-glass requirements.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:

   a. Deflection exceeding specified limits.
   b. Thermal stresses transferred to building structure.
   c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
   d. Noise or vibration created by wind and thermal and structural movements.
   e. Loosening or weakening of fasteners, attachments, and other components.
   f. Sealant failure.

B. Structural Loads:

1. Wind Loads: 25 lb/sf

C. Structural-Test Performance: Provide glazed aluminum curtain-wall systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Duration: As required by design wind velocity but not less than 10 seconds.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches, and to 1/240 of clear span plus 1/4 inch, for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.

E. Thermal Movements: Provide glazed aluminum curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft..

1.4 SUBMITTALS

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

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain-wall systems.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Welding certificates.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazed aluminum curtain-wall systems.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for glazed aluminum curtain-wall systems including the following:
   a. Shop Drawings, Project-specific preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

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.

C. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Water leakage.
   d. Failure of operating components to function normally.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. 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. Warranty Period: 20 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:

B. Basis-of-Design Product: The design for glazed aluminum curtain-wall systems is based on Vistawall CW-250 2 1/2 x 7 1/4, 1" captured glazing system. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. EFCO Corporation.
2. United States Aluminum.
3. Vistawall Architectural Products.

2.2 FRAMING SYSTEMS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 611.
3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing Gaskets: As recommended by manufacturer for joint type.

H. Framing Sealants: As recommended by manufacturer for joint type.

2.3 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer for joint type.

2.4 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.5 FABRICATION

A. Form aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints, condensation occurring 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 prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Provisions for reglazing from exterior.

C. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Color Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified Division 8 Section "Glazing."

F. Install sealants as specified in Division 7 Section "Joint Sealants."

G. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.3 FIELD QUALITY CONTROL

A. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 08911

SECTION 09220 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior portland cement plasterwork (stucco) on metal lath plaster bases.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealants installed with exterior portland cement plaster (stucco).

1.3 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.

D. Samples for Verification: For each type of factory-prepared, colored, smooth float textured finish coat indicated; 12 by 12 inches, and prepared on rigid backing.

1.4 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.

1.5 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. 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.

3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

1. Manufacturers:

a. Dale/Incor.
b. Marino/Ware; Division of Ware Industries, Inc.
c. Unimast, Inc.

2. Diamond-Mesh Lath: Self-furring.

a. Weight: 3.4 lb/sq. yd.

2.3 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Zinc and Zinc-Coated (Galvanized) Accessories:

1. Manufacturers:

a. Dietrich Industries, Inc.
b. Fry Reglet Corp.
c. Milcor Co.
d. Unimast, Inc.

2. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

3. Cornerbeads: Fabricated from 26 Ga. zinc-coated (galvanized) steel.

a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.

4. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

C. Aluminum Accessories:

1. Manufacturers:

a. Fry Reglet Corp.
b. Pittcon Industries

2. Aluminum to be extruded alloy 6063 T5, clear anodized finish – painted black.
3. 1/2" (FPM -75-50) and 1 1/2" (FPM-75-150) non vented reveal as details on drawings.

2.4 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 long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

2.5 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Lime: ASTM C 206, 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:

a. Pleko Products, Inc.
b. Synergy, Inc.
c. Sto Corp.

2. Color and Texture: As selected by Architect from manufacturer's full range of colors, fine texture.

2.6 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. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

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 (sum of separate volumes of each component material).
b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).

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.

1. 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-plaster bases 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 self-furring diamond-mesh lath.
2. Flat-Ceiling and Horizontal Framing: Install self-furring diamond-mesh lath.
3. On Solid Surfaces, Not Otherwise Furred: Install self-furring diamond-mesh lath.

3.4 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Control Joints: Install control joints at locations indicated on Drawings.

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

    a. Vertical Surfaces: 144 sq. ft..
    b. Horizontal and other Non-vertical Surfaces: 100 sq. ft..

2. At distances between control joints of not greater than 18 feet on center
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 from a true plane in finished plaster surfaces, as measured by a 10-foot 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. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

C. Plaster Finish Coats: Apply to provide float finish to match Architect's sample.

3.6 CUTTING AND PATCHING

A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, 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 09220

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

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. Interior gypsum wallboard.
2. Tile backing panels.
3. Non-load-bearing steel framing.

B. Related Sections include the following:

1. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in gypsum board assemblies.

1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

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

B. Samples: For the following products:

1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

B. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups for the following applications:

a. Surfaces with texture finishes.

b. Surfaces indicated to receive nontextured paint finishes.

2. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of the following:

1. Steel Framing and Furring:
   a. Dietrich Industries, Inc.
   b. MarinoWare; Division of Ware Ind.
   c. National Gypsum Company.
   d. Unimast, Inc.

2. Gypsum Board and Related Products:
   a. G-P Gypsum Corp.
   b. National Gypsum Company.
   c. United States Gypsum Co.

2.2 STEEL PARTITION

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.
2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0270 inch.
2. Depth: As indicated.

C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base Metal Thickness: 0.0270 inch.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Depth:1-1/2 inches.
2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.
3. Z-furring is available in 1-, 1-1/2-, 2-, 2-1/2-, and 3-inch (25.4-, 38.1-, 50.8-, 63.5-, and 76.2-mm) depths.

2.3 Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 STEEL SUSPENDED CEILING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Hanger Attachments to Concrete: As follows:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

D. Furring Channels (Furring Members): Commercial-steel sheet with manufacturer's standard corrosion-resistant zinc coating.

1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base Metal Thickness: 0.0179 inch.
b. Depth: As indicated.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0179 inch.

E. Grid Suspension System for Interior Ceilings (Contractors option): ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

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

a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
b. Chicago Metallic Corporation; System.

c. USG Interiors, Inc.; Drywall Suspension System.

2.5 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type:

a. Thickness: 5/8 inch.
b. Long Edges: Tapered.
c. Location: As indicated.

2. Type X:

a. Thickness: 5/8 inch.
b. Long Edges: Tapered.
c. Location: As indicated.

2.6 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; Wonderboard.
b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
c. United States Gypsum Co.; DUROCK Cement Board.

3. Thickness: 5/8 inch.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead: Use at outside corners.
b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
c. Expansion (Control) Joint: Use where indicated.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: 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.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.

2.9 ACOUSTICAL SEALANT

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

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:

a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
b. Pecora Corp.; BA-98.
c. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.10 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 thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

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. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

2.11 TEXTURE FINISHES

A. Products: Subject to compliance with requirements, provide one of the following:

1. Aggregate Finish:

a. G-P Gypsum Corp.; GyProc Vermiculite Ceiling Texture.
b. United States Gypsum Co.; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).

B. Primer: As recommended by textured finish manufacturer.

C. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.

1. Texture: Light-spatter.

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

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

a. Use deep-leg deflection track where framing is secured to existing structure.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling 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 ceiling suspension system. 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 spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.

C. Screw furring to wood framing.

D. Wire-tie furring channels to supports.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

1. Hangers: 48 inches.
2. Carrying Channels (Main Runners): 48 inches.
3. Furring Channels (Furring Members): 16 inches.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch short of full height to provide perimeter relief.
2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches on center, unless otherwise indicated.
2. Multilayer Construction: 16 inches on center, unless otherwise indicated.
3. Cementitious Backer Units: 16 inches on center, unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. 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.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut

edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

I. Form control and expansion joints with space between edges of adjoining gypsum panels.

J. Cover both faces of steel stud partition 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. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches on center for vertical applications.

N. Space fasteners in panels that are tile substrates a maximum of 8 inches on center

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Tile Backing Panels:

1. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
2. Areas Not Subject to Wetting: Install standard gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
3. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. FINISHING GYPSUM BOARD ASSEMBLIES

D. 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.

E. Prefill open joints and damaged surface areas.

F. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.9 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.

3.10 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:

a. Installation of 80 percent of lighting fixtures, powered for operation.
b. Installation, insulation, and leak and pressure testing of water piping systems.
c. Installation of air-duct systems.
d. Installation of air devices.
e. Installation of mechanical system control-air tubing.
f. Installation of ceiling support framing.

END OF SECTION 09260

SECTION 09310 - CERAMIC TILE

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. High Density Glazed Ceramic floor tile.
2. Porcelain wall tile.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

1.5 SUBMITTALS

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

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Qualification Data: For Installer.

G. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile 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 a single manufacturer and each aggregate from one source or producer.

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 requirement in ANSI A137.1 for labeling sealed 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 avoided.

D. Store liquid latexes and emulsion adhesives 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.

1.9 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. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

2.3 TILE PRODUCTS

A. Manufacturers:

1. American Olean; Div. of Dal-Tile International Corp.
2. Daltile; Div. of Dal-Tile International Inc.
3. GranitiFiandre.
4. American Tile Supply.
5. Lone Star Ceramics.

B. High Density Glazed Ceramic Wall Tile: Flat tile as follows:

1. Composition: Vitreous or impervious natural clay.
2. Surface: Matte
3. Module Size: 4-1/4 inch square, nominal.
4. Nominal Thickness: 3/8 inch.

5. Face: Plain with cushioned edges.
6. Basis-of-Design Product: Daltile 'Matte', color: 0799 'Pearl White'.

C. Unglazed Ceramic Mosaic Floor Tile: Flat tile as follows:

1. Composition: Porcelain.
2. Module Size: 2-by-2 inch.
3. Thickness: 1/4 inch.
4. Face: Plain with square edges.
5. Finish: Unglazed, unpolished, coefficient of friction equal to or exceeding 0.7 wet.
6. Basis-of-Design Product: Daltile Keystones, colors: D037 'Pepper White'; and D200 'Desert Gray Speckle'.

D. High Density Ceramic Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Base for Thin-Set Mortar Installations: Daltile 'Matte', color 0799 'Pearl White'; Surface bullnose, cove and base shapes in sizes coordinated with field tile.

2.4 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Bostik.
3. LATICRETE International Inc.
4. Custom Building Products.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

C. Polymer-Modified Tile Grout: ANSI A118.7, Custom Building Products #381 "Bright White" at Pepper White and Pearl White tile. Custom Building Products #115 Platinum" at Desert Gray Speckle tile.

1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

a. Unsanded grout mixture for joints 1/8 inch and narrower.
b. Sanded grout mixture for joints 1/8 inch and wider.

2.5 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

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.

1. Products:

a. Dow Corning Corporation; Dow Corning 786.
b. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
c. Tremco, Inc.; Tremsil 600 White.

2.6 MISCELLANEOUS MATERIALS

A. 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.

B. Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

1. Products:

a. Bonsal, W. R., Company; Grout Sealer.
b. Bostik; CeramaSeal Grout Sealer.
c. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.

2.7 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 oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. 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 before installing tile.

3. 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. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. 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.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. 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.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

G. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Ceramic Tile: 1/16 inch.

C. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.5 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:

1. Porcelain Tile: 1/16 inch.

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 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 that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

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 cleaner from tile surfaces.

3.7 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior floor installation on concrete; thin-set mortar; TCA F113 and ANSI A108.5.

1. Tile Type: Glazed ceramic.
2. Thin-Set Mortar: Dry-set Latex- portland cement mortar.
3. Grout: Polymer-modified unsanded grout.

3.8 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior wall installation over gypsum board; thin-set mortar; TCA W243 and ANSI A108.5.

1. Tile Type: Porcelain tile.
2. Thin-Set Mortar: Dry-set portland cement mortar.
3. Grout: Polymer-modified unsanded cement grout.

END OF SECTION 09310

SECTION 09511 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

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

B. Qualification Data: For testing agency.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

C. Coating-Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273.

2.3 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING TYPE-1

A. Products:

1. Armstrong “Fine Fissured”, or approved equal.

B. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for Type XII, mineral base with painted finish; Form 2, water felted and pattern as follows:

1. Pattern: CD (perforated, small holes and fissured) E (lightly textured).

C. Color: White
D. LR: Not less than 0.85.
E. NRC: Not less than 0.55.
F. CAC: Not less than 35.
G. Edge Detail: Square
H. Thickness: 5/8 inch
I. Size: 24 by 24 inches.

J. Antimicrobial Treatment: Yes

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated (restrooms and kitchen).

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Products:

1. Armstrong – Prelude XL 15/16" or approved equal

B. Square Lay-In, Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: High-baked polyester on steel, white

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers:

1. Armstrong World Industries, Inc.
2. Celotex Corporation; Architectural Ceilings Marketing Dept.
3. USG Interiors, Inc.

B. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. 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.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

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 on center and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. 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.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651 - RESILIENT FLOOR TILE

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. Vinyl composition tile (VCT).
   2. Resilient wall base and accessories.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 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. Store tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066.
1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO
3. Tarkett Inc.

B. Class: Premium priced patterns.

C. Wearing Surface: ASTM F 1066 Class 2 - through-pattern

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Products: Basis of Design: Armstrong Standard Stonetex Excelon #52122 “Pebble Gray”

G. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.3 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.
1. Roppe Corporation.
2. Armstrong World Industries, Inc.
3. Azrock Commercial Flooring, DOMCO.
4. Burke Mercer Flooring Products.

B. Type (Material Requirement): TS (rubber, vulcanized thermoset).

C. Style: Cove (with top-set toe).

D. Minimum Thickness: 0.125 inch.

E. Height: 4 inches.

F. Lengths: Coils in manufacturer's standard length.

G. Outside Corners: Job formed.

H. Inside Corners: Job formed.

I. Surface: Smooth.

J. Colors: Roppe #123 “Charcoal”; and #174 “Smoke”

2.4 RESILIENT MOLDING ACCESSORY

A. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet.

1. Burke Mercer Flooring Products.
2. Roppe Corporation.

B. Material: Rubber.

2.5 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 manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT and Asphalt Tile Adhesives: 50 g/L.
b. Cove Base Adhesives: 50 g/L.
c. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

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.

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

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

C. 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.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

B. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

C. Extend tiles into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

E. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

F. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

a. Use commercially available product acceptable to manufacturer.
b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09651

SECTION 09680 - CARPET

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. Dense textured loop carpet.

B. Related Sections include the following:

1. Division 1 Section “Selective Demolition” for removing existing floor coverings.
2. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. A seam layout shall be submitted to the Architect diagramming the location of all cuts, seams, edge strips and other pertinent installation details. No carpet shall be installed until the written approval of the Architect has been received.

B. Colors and Samples: The Contractor shall submit a full range of samples to the Architect of colors and patterns for selection and approval prior to ordering materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

A. General Warranty: Special 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.

B. Installation Warranty: 2 years

C. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period: Useful life of the original installation

a. Lifetime against excessive surface ware (no more than 10% loss of pile fiber weight).
b. Lifetime static protection.
c. Lifetime stain removal.
d. Lifetime color fastness.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET

A. Product: Subject to compliance with requirements, provide the following:

1. J+J Invision

a. Style: Fuse Broadloom (3530); and Merge Broadloom (3520)
b. Yarn: 100% Encore ® SD Ultima® Nylon with recycled content.
c. Dye Method: Solution Dyed
d. Surface Texture: Textured Loop
e. Gauge: 1/10 (3.94 rows/cm)
f. Yarn Weight: Min. 20 oz./sq. yd.
g. Finished Pile Thickness: 0.116 inch minimum (ASTM D-418).
h. Density: 6,207 (ASTM D-418-82).
i. Secondary Backings: PremierBac™ Plus with DOW LOMAX ™ Technology
j. Width: 12 feet.
k. Color: 1456 "Meet" (both styles)
l. Special Treatments: ProTex® Fluorochemical

2. Products manufactured by J Commercial, Patcraft and Shaw that are equivalent in every respect to the specified product may be considered.

B. Performance Characteristics: As follows:

1. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
2. Resistance to Insects: Comply with AATCC-24.
3. Noise Reduction Coefficient (NRC): per ASTM C 423.
4. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
5. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
6. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

C. VOC Limits: Provide carpet that complies with the following limits for VOC content when tested according to ASTM D 5116:

1. Total VOCs: 0.5 mg/sq. m x h.
2. 4-PC (4-Phenylcyclohexene): 0.05 mg/sq. m x h.
3. Formaldehyde: 0.05 mg/sq. m x h.
4. Styrene: 0.4 mg/sq. m x h.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet.

1. Product: Commercial 600 low VOC wetset adhesive, or as approved and supplied by carpet manufacturer.
2. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:

a. Total VOCs: 10.00 mg/sq. m x h.
b. Formaldehyde: 0.05 mg/sq. m x h.
c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

C. Tackless Carpet Stripping: Water-resistant plywood in strips as required to match cushion thickness and that comply with CRI 104, Section 11.3.

D. Seaming Cement: Seams shall be solvent welded for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

1. Products: Commercial 557 strong seam sealer, or as approved and supplied by carpet manufacturer.

E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

F. Joint, crack and depression filler: Epoxy patching compounds:

1. “Epolith Patcher” – Sonneborn Building Products
2. “Thiopory 60” – A.C. Horn Products

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."

B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Level adjoining border edges.

C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 09680

SECTION 09912 - PAINTING (PROFESSIONAL LINE PRODUCTS)

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 surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork.
b. Finished mechanical and electrical equipment.
c. Light fixtures.
d. Toilet Partitions
e. Pre-finished metal louvers.
f. Pre-finished metal building panels (walls and roof)

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.

c. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Sensing devices.
c. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
2. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
3. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
4. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining 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.

2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit 3 Samples on the following substrates for Architect's review of color and texture only:

    a. Stained and Painted Wood: 8 inch square Samples for each color and material on hardboard.
    b. Ferrous Metal: 4 inch square Samples of flat metal and 6 inch long Samples of solid metal for each color and finish

D. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in 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. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers 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.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F 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 manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. PPG Industries, Inc. (Pittsburgh Paints).
3. Sherwin-Williams Co. (Sherwin-Williams).
4. ICI

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR PRIMERS

A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; Speedhide Interior/Exterior Rust Inhibitive Steel Primer 6-208: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

B. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; Speedhide Interior/Exterior Rust Inhibitive Steel Primer 6-209: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils.

2.4 INTERIOR PRIMERS

A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
2. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
3. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

B. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

C. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.

1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils.
2. Pittsburgh Paints; 17-955 Seal Grip Latex Enamel Undercoater: Applied at a dry film thickness of not less than 1.2 mils.
3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

D. Interior Stained Wood Primer
1. Sherwin-Williams; Wood Classic Stain. WIPE ON – DO NOT SPRAY.

2.5 EXTERIOR FINISH COATS

A. Exterior Semi-Gloss Acrylic Enamel for Ferrous and Other Metals: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28: Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W200 Series: Applied at a dry film thickness of not less than 2.4 mils.

B. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.
1. Benjamin Moore; Moorcraft Super Spec Latex House & Trim Paint No. 170: Applied at a dry film thickness of not less than 1.1 mils.
2. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils.
3. Sherwin-Williams; ProClassic Waterborne Acrylic Semi-Gloss (B31 Series): Applied at a dry film thickness of not less than 1.3 mils.

2.6 INTERIOR FINISH COATS

A. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than 1.2 mils.
2. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil.
3. Sherwin-Williams; ProClassic Waterborne Acrylic Semi-Gloss (B31 Series): Applied at a dry film thickness of not less than 1.3 mils.

B. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.

1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel No. M28: Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; ProClassic Waterborne Acrylic Semi-Gloss (B21 Series)

2.7 INTERIOR WOOD STAINS AND VARNISHES

A. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Benwood Penetrating Stain No. 234.
2. Olympic (Pittsburgh Paints); 41570 Series Premium Interior Fast Dry Oil Wood Stain.
3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.

B. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Benwood Paste Wood Filler No. 238.

2. Sherwin-Williams; Sher-Wood Fast-Dry Filler.

C. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Stays Clear Acrylic Polyurethane No. 423, Satin.
2. Olympic (Pittsburgh Paints); 42786 Interior Water Based Polyurethane Satin.
3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, 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 paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

3. Ferrous Metals: Clean ungalvanized 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 SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
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 paint manufacturer, and touch up with same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying 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. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of 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. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. 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. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
5. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
4. Exposed conduit.

H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.

2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior ferrous-metal primer.
b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.

a. Primer: Exterior galvanized metal primer.
b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

3.8 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior semigloss acrylic enamel.

2. Full-Gloss Acrylic-Enamel Finish (accent paint): Two finish coats over a tinted primer.

a. Primer: Interior gypsum board tinted primer.
b. Finish Coats: Interior Full-Gloss acrylic enamel.

B. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior full-gloss acrylic enamel.

C. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. Finish Coats: Interior flat latex-emulsion size.

3.9 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

1. Waterborne Stain Satin-Varnish Finish: Two finish coats of waterborne clear satin varnish over a sealer coat and waterborne interior wood stain. Wipe wood filler before applying stain.
   a. Stain Coat: Interior wood stain.
   b. Sealer Coat: Clear sanding sealer.

END OF SECTION 09912

SECTION 10155 - TOILET COMPARTMENTS

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 plastic-laminate units as follows:

1. Toilet Enclosures: Floor anchored, overhead braced
2. Urinal Screens: Wall hung, flat panel.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for blocking.
2. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.

C. Samples for Initial Selection: For each type of unit indicated.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bobrick Washroom Equipment, Inc.

2. Mid South Manufacturing Co., (Micartsa)
3. Sanymetal; a Crane Plumbing Company.
4. Metpar Steel Products
5. Tex-Lam Manufacturing, Inc.

B. Plastic Laminate: NEMA LD 3, HGS, 1/16" nominal thickness.

1. Color and Pattern: Wilsonart Laminate #4877-39 "Grey Mesh"

C. Door, Panel, and Pilaster Construction: Doors and panels 1" thick; high pressure plastic laminated bonded to chip board or plywood cores with plastic resin adhesive applied under continuous heat and pressure until cured. Panels, pilasters, and doors to be pre-drilled for application of fittings and hardware. Pilasters shall be anchored to floor with leveling device and shall have 3" high, one piece, polished 302 stainless steel shoes.

1. Core Material: ANSI A208.1, Grade M-2 particleboard with 45-lb density.
2. Doors and Panels: Finished to not less than 1 inch thick.
3. Pilasters: Provide construction to comply with the following:

a. Finished to not less than 1-1/4 inches thick.

D. Pilaster Shoes: Stainless steel, ASTM A 666, Type 302 or 304, not less than 0.0312 inch specified thickness and 3 inches high, finished to match hardware.

E. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; aluminum

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Clear anodized aluminum

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Adjust doors to rest at 15 degree open (10 degree at handicap stall).
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hooks and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10155

SECTION 10431 - SIGNAGE

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. Dimensional characters.
   2. Panel signs.

B. Related Sections include the following:

   1. Division 1 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Division 14 Section for code-required elevator signage.
   3. Division 15 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
   4. Division 16 Sections for electrical service and connections for illuminated signs.
   5. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
   6. Division 16 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

B. TAS: Texas Accessibility Standards

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.

   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
   1. Acrylic sheet.

2. Polycarbonate sheet.
3. Die-cut vinyl characters and graphic symbols.

D. Sign Schedule: Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 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.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines, Texas Accessibility Standards and ICC/ANSI A117.1.

1.8 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

B. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:

1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

C. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 DIMENSIONAL CHARACTERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advance Corporation; Braille-Tac Division.
2. ASI-Modulex, Inc.
3. Innerface Sign Systems, Inc.

B. Cutout Characters: Provide characters with square-cut, smooth edges. Comply with the following requirements:
1. Vinyl: Pressure sensitive, 3.5 mils thick.
   a. Color: As selected by Architect from manufacturer's full range.
2. Mounting: Adhesive for substrates encountered.

C. Dimensional Character Sign Schedule:

1. Sign Type:
   a. Character Size: 2 inch high letters.
   b. Text/Message:
      1) Sign 1: HUMAN RESOURCES on door 118
      2) Sign 2: ACCOUNTING on door 132A
      3) Sign 3: ACCOUNTING on door 132B
      4) Sign 4: CONFERENCE on door 149A
   c. Location: on glass of doors, 60 inches above the floor.

2.3 PANEL SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ASI Sign Systems “Inform Plaque Signs” or a comparable product by one of the following:
1. Advance Corporation; Braille-Tac Division.
2. Innerface Sign Systems, Inc.
3. InPro Corporation

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Acrylic Sheet: 0.060 inch thick.
2. PVC Sheet: 0.060-inch- thick, extruded, high-impact PVC plastic.
3. Edge Condition: Square cut.
4. Corner Condition: Square.
5. Mounting: Unframed.

a. Wall mounted with two-face tape.

6. Color: As selected by Architect from manufacturer's full range.
7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

C. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.

D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Opaque acrylic sheet.
2. Raised-Copy Thickness: Not less than 1/32 inch.

E. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for three years for application intended.

1. Color: As selected by Architect from manufacturer's full range.

F. Panel Sign Schedule: Refer to drawings for panels sign schedule and details

2.4 FINISHES, GENERAL

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 not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for three years for application intended.

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 work.

B. Verify that items are sized and located to accommodate signs.

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

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10431

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

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. Portable fire extinguishers.
2. Fire-protection cabinets for the following:

   a. Portable fire extinguishers.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers:
   1. Amerex Corporation.
   2. JL Industries, Inc.
   3. Larsen's Manufacturing Company.

B. General: Provide fire extinguishers of type, size, and capacity for each mounting bracket indicated.
   1. Valves: Manufacturer's standard.
   2. Handles and Levers: Manufacturer's standard.
   3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Regular Dry-Chemical Type in Steel Container: UL-rated 10-B:C, 5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

2.3 FIRE-PROTECTION CABINET “FEC”

A. Basis-of-Design Product: Larsons 2409 6R or a comparable product by one of the following:

B. Manufacturers:
   1. JL Industries, Inc.

C. Cabinet Type: Suitable for fire extinguisher.

D. Cabinet Construction: Non-rated.

E. Cabinet Material: Enameled-steel sheet.
   1. Shelf: Same metal and finish as cabinet.

F. Semi-recessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

G. Cabinet Trim Material: Steel sheet.

H. Door Material: Steel sheet.

I. Door Style: Vertical duo panel with frame.

J. Door Glazing: Tempered float glass (clear).

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

L. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
   a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet door.
      2) Application Process: Die Cut.
      3) Lettering Color: Red.
      4) Orientation: Vertical.

M. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
   a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet and door.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material.
   a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

B. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

SECTION 10801 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.

B. Related Sections include the following:

1. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.

1.3 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. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.5 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.

1.6 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. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. 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.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on Bobrick Washroom Equipment, Inc. products as indicated on the drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Bradley Corporation.
2. American Standard Brands.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in 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 10801

SECTION 14240 - HYDRAULIC ELEVATORS

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 handicap accessibility upgrades to existing hydraulic passenger elevator.

B. Related Requirements:

1. Division 1 Section "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Division 9 Section “Carpet” for finish flooring in elevator cars.
3. Division 9 painting Sections for field painting of hoistway entrance doors and frames.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:
1. Include large-scale layout of car-control station.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

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. KONE Inc.
   2. Otis Elevator Co.
   3. Schindler Elevator Corp.
   4. ThyssenKrupp Elevator.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC A117.1, and the Texas Accessibility Standards.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator components. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:
   1. Car Enclosures:
      a. Car Fixtures: Satin stainless steel, No. 4 finish.
      b. Side and Rear Wall Panels: Existing wood panels – clean, sand, and re-finish.
      c. Door Faces (Interior): Existing stainless steel – clean and polish.
      d. Ceiling: Replace existing lamps in light fixtures.
      e. Floor prepared to receive carpet (specified in Division 9 Section "Carpet").

   2. Hoistway Entrances:
      a. Frames: Clean, prepare and paint existing painted steel frames.
      b. Doors: Clean, prepare and paint existing painted steel frames.

   3. Hall Fixtures: Provide new satin stainless steel, No. 4 finish.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.5 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door where existing panel is located.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at the floor served. Include travel direction arrows if not provided in car-control station.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.

F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel.

2.6 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

C. Stainless-Steel Bars: ASTM A 276, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Aluminum Extrusions: ASTM B 221, Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
   1. Place hall lanterns either above or beside each hoistway entrance.
   2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION
   1. Temporary Use: Do not use elevator for construction purposes. [

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

END OF SECTION 14240

SECTION 13704

SECURITY ACCESS SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security access devices.

B. Access control panel.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SYSTEM DESCRIPTION

A. Security Access System: Control access to building using encoded cards:
   1. Selected Exterior Doors: Control access into building.

1.04 SUBMITTALS

A. Shop Drawings: Provide system wiring diagram showing each device and wiring connection required.

B. Product Data: Provide electrical characteristics and connection requirements.

C. Project Record Documents: Record actual locations of access authorization equipment.

D. Operation Data: Operating instructions.

E. Maintenance Data: Maintenance and repair procedures.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

1.06 MAINTENANCE SERVICE

A. Furnish service and maintenance of security access system for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Access System:
   1. TAC Controls.
   2. Substitutions: Not Permitted.

2.02 COMPONENTS

A. Security Access Control Panel:

B. Encoded Card Readers:

C. Encoded Card Controllers:

D. Encoded Cards:

E. Motion Detectors:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use 16 AWG minimum size conductors for detection and signal circuit conductors. Install wiring in conduit.

C. Make conduit and wiring connections to door hardware devices furnished and installed under Section 08710.

3.02 CLOSEOUT ACTIVITIES

A. Demonstrate normal and abnormal modes of operation, and required response to each.

END OF SECTION

SECTION 13851

FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

1.02 REFERENCE STANDARDS

A. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).

B. NFPA 70 - National Electrical Code; 2008.

C. NFPA 72 - National Fire Alarm Code; 2007.

D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 2009.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with the contract documents.
   4. Proposed maintenance contract.

C. Drawings must be prepared using AutoCAD Release 2004 or higher.
   1. City of Bryan will provide floor plan drawings for Contractor's use; verify all dimensions on City of Bryan-provided drawings.

D. Evidence of designer qualifications.

E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
   10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.

11. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
12. Certification by Contractor that the system design complies with the contract documents.

F. Evidence of installer qualifications.

G. Evidence of maintenance contractor qualifications, if different from installer.

H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

I. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to City of Bryan.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

J. Project Record Documents: Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and

address.
4. Certified in Bryan, Texas as fire alarm installer.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.05 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Basis of Design: Match exisiting fire alarm component manufacturer.

B. Fire Alarm Control Units: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com.Series 9200 or equal
2. Provide all control units made by the same manufacturer.

C. Initiating Devices, and Notification Appliances:
1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Protected Premises: Entire existing building as shown on the drawings. The existing tunnel is not in the base scope.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. The Americans With Disabilities Act (ADA).
   b. Texas Accessibility Standard
   c. The requirements of the State Fire Marshal.
   d. The requirements of the local authority having jurisdiction.
   e. Applicable local codes.
   f. The contract documents (drawings and specifications).
   g. NFPA 101.
   h. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
5. Hearing Impaired Occupants: Provide visible notification devices in all public areas as shown on the prints and elsewhere as may be required by the AHJ.
6. Master Control Unit (Panel): New.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: Existing proprietary station operated by City of Bryan, located at _____.
3. Remote Supervising Station: UL-listed central station under contract to facility.
4. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

5. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
6. Auxiliary Connection Type: Local energy.

C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
4. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
3. Duct smoke detectors.

C. Elevators:
1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Initiating Devices:
1. Smoke Detectors:.
2. Duct Smoke Detectors:.

3. Heat Detectors:.

E. Notification Appliances:
1. Horns:.
2. Speakers:.
3. Strobes:.

F. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41 B3 combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to City of Bryan.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
2. Provide one for each control unit where operations are to be performed.
3. Obtain approval of City of Bryan prior to mounting; mount in location acceptable to City of Bryan.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain City of Bryan's Fire Marshall approval of submittal drawings showing device locations, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify City of Bryan 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to City of Bryan.
1. Be prepared to conduct any of the required tests.

2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

3.04 MAINTENANCE

A. See Section 01700 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide to City of Bryan, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by City of Bryan:
1. Provide on-site response within 2 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to City of Bryan.
3. City of Bryan will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to City of Bryan's representative upon completion of site visit.

G. Comply with City of Bryan's requirements for access to facility and security.

END OF SECTION

SECTION 13925

FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.02 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for City of Bryan's use in maintenance of project.
   1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   2. Sprinkler Wrenches: For each sprinkler type.

H. Provide copy of current license of fire protection installer and fire protection designer (if not PE). Submittals provided without these documents will be rejected.

1.04 QUALITY ASSURANCE

A. Conform to UL requirements.

B. Design system under direct supervision of a Professional Engineer or licensed fire protection design specialist experienced in design of this Work and licensed in Texas.

C. Installer Qualifications: Company specializing in performing the work of this section documented experience and licensed to perform work in Texs.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet located adjacent to alarm valve.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building. Provide dry system for all the buildings except for the exhibit hall additions (Alternates 3 & 4) where the existing wet type system shall be extended.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.
   1. If test data is not available, review Civil drawings for pump design and estimate losses in new domestic water pipe from routing shown on Civil drawings.
   2. Revise design when test data available prior to submittals.

D. Interface system with building control system.

E. Existing fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

2.03 SPRINKLERS

A. Suspended Ceiling Type: Standard pendant type with matching push on escutcheon plate.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type: Standard upright type with guard.
   1. Finish: Brass.
   2. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate and guard.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.

B. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings, and inlet strainer.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Center sprinklers in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.

F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G. Flush entire piping system of foreign matter.

H. Install guards on sprinklers in closets, elevator equipment rooms, and other areas with exposed strucures less than 12' AFF.

I. Hydrostatically test entire system.

J. Require test be witnessed by authority having jurisdiction.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 15072

VIBRATION ISOLATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Inertia bases.

B. Vibration isolators.

1.02 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

C. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Isolation Technology, Inc: www.isolationtech.com.

B. Kinetics Noise Control, Inc: www.kineticsnoise.com.

C. Mason Industries: www.mason-ind.com.

D. Substitutions: Not permitted.

2.02 INERTIA BASES

A. Structural Bases:
   1. Construction: Welded structural steel with gusseted brackets, to support equipment and motor, with motor slide rails.
   2. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

2.03 VIBRATION ISOLATORS

A. Restrained Open Spring Isolators:
   1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
   2. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
   3. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
   4. Restraint: Provide heavy mounting frame and limit stops.
   5. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.

B. Closed Spring Isolators:
   1. Type : Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
   2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
   3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad

isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.

4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.

C. Restrained Closed Spring Isolators:

1. Type : Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.
4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.

D. Neoprene Pad Isolators:

1. Rubber or neoprene waffle pads.
   a. Hardness: 30 durometer.
   b. Thickness: Minimum 1/2 inch.
   c. Maximum Loading: 50 psi.
   d. Rib Height: Maximum 0.7 times width.
2. Configuration: Single layer.
3. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

E. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bases:

1. Set steel bases for one inch clearance between housekeeping pad and base.
2. Adjust equipment level.

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Pipe Markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.03 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Pipe Markers for Outdoor Use: Seton Weather-Code; media indicator and detachable direction-of-flow arrows on weather-resistant pressure-sensitive vinyl sheet; service temperature -40 to 175 degrees F.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape,

minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

E. Identify control panels and major control components outside panels with plastic nameplates.

F. Identify thermostats relating to terminal boxes or valves with nameplates.

G. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 40 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 15082

PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

D. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2008.

E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

G. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2008.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Samples: Submit two samples of any representative size illustrating each insulation type.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.05 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.

B. Insulation: ASTM C 547; rigid molded, noncombustible.
   1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armstrong World Industries; www.armaflex.com.
   2. Armacell International: www.armacell.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3; use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic:
      a. Compatible with insulation.

B. Aluminum Jacket: ASTM B 209 (ASTM B 209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish heating water piping with aluminum jacket. Finish chilled water piping with canvas jacket sized for finish painting.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: up to and including 1.5 inches
            (a) Thickness: 1 inch.
         2) Pipe Size Range: over 1.5 inches
            (a) Thickness: 2 inch.

2. Domestic Hot Water Recirculation:
    a. Glass Fiber Insulation:
        1) Pipe Size Range: all
            (a) Thickness: 1 inch.

B. Cooling Systems:
    1. Condensate Drains from Cooling Coils:
        a. Cellular Foam Insulation:
            1) Pipe Size Range: all.
            2) Thickness: 3/4 inch.

END OF SECTION

SECTION 15083

HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

C. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007.

D. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 1990 (Reapproved 2004).

E. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2008a.

F. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.

G. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
   1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.

3. Maximum moisture absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

2.03 POLYISOCYANURATE CELLULAR PLASTIC

A. Insulation Material: ASTM C 591, rigid molded modified polyisocyanurate cellular plastic.
1. Dimension: Comply with requirements of ASTM C 585.
2. 'K' value: 0.18 at 75 degrees F, when tested in accordance with ASTM C 518.
3. Minimum Service Temperature: -70 degrees F.
4. Maximum Service Temperature: 300 degrees F.
5. Water Absorption: 0.5 percent by volume, maximum, when tested in accordance with ASTM D 2842..
6. Moisture Vapor Transmission: 4.0 perm in.
7. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

D. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
4. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07840.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return:
      a. Glass Fiber
         1) Pipe Size Range: up to and including 1.5 inches
            (a) Thickness: 1 inch.
         2) Pipe Size Range: over 1.5 inches
            (a) Thickness: 2 inch.

B. Cooling Systems:
   1. Chilled Water:
      a. Closed Cell Polyisocyanurate
         1) Pipe Size Range: up to and including 1.5 inches
            (a) Thickness: 1 inch.
         2) Pipe Size Range: over 1.5 inches
            (a) Thickness: 1 1/2 inch.

END OF SECTION

SECTION 15083

PIPING SAFETY COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Safety Covers.

B. Lavatory Piping Enclosure.

C. Basin/Sink Piping Enclosure.

1.02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2004.

C. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2003.

D. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2004.

1.03 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for products specified in this section.

B. Manufacturer's printed installation instructions for each specified product.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions for products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Truebro, Inc; 7 Main Street, P.O. Box 440, Ellington, CT 06029. ASD. Tel: (800) 340-5969 (outside CT), (860) 875-2868 (inside CT). Fax: (860) 872-0300. Email: info@truebro.com. www.truebro.com.

B. Substitutions: Permitted.

2.02 PIPING INSULATION ACCESSORIES

A. Provide products that comply with the following:
   1. Americans With Disabilities Act (ADA), Article 4.19.4.
   2. Texas Accessibity Standards.
   3. BOCA Basic Building Code.
   4. Requirements of International Building Code and Texas Accessibility Standards.

B. Piping Safety Covers: Truebro Lav-Guard.
   1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
   2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing; having the following performance characteristics:

a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.
c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.
4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.
5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
6. Color: China White, gloss finish; paintable.
7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

C. Lavatory Piping Enclosure: Truebro Lav-Shield.
1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 1/8 inch wall thickness, factory-punched for manufacturer's wall fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:
a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
3. Vinyl Color: China White, fine-textured finish; paintable.
4. Fasteners: Manufacturer's standard stainless steel wall fasteners with tamper-resistant heads.

D. Basin/Sink Piping Enclosure: Truebro Basin Guard.
1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 0.093 inch wall thickness, factory-molded flanges for fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:
a. Burning characteristics, when tested in accordance with ASTM D 635: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB).
b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
3. Width: 36 inches.
4. Color: White, fine-textured finish; paintable.
5. Fasteners: Supply non-corroding fasteners with tamper-resistant heads; type recommended by manufacturer for indicated project conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping configurations are correct type for piping cover component configurations specified.

3.02 INSTALLATION

A. Install products of this section in accordance with manufacturer's printed installation instructions.

3.03 PROTECTION OF INSTALLED PRODUCTS

A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

END OF SECTION

SECTION 15086

DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Insulation jackets.

1.02 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

D. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2002.

E. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2004.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

G. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Samples: Submit two samples of any representative size illustrating each insulation type.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: Not permitted.

B. Insulation: ASTM C 553; flexible, noncombustible blanket.
   1. 'K' value: 0.27 at 75 degrees F, when tested in accordance with ASTM C 518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 3.0 percent by weight.
   4. Density: 1.0 lbs/cf.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape: As approved by manufacturer

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: Not permitted.

B. Insulation: ASTM C 612; rigid, noncombustible blanket.
   1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C 518.
   2. Maximum service temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.04 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

B. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with aluminum jacket or provide rigid insulation.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft of Exterior Openings:
   1. Flexible Glass Fiber Duct Insulation: 2 inches thick.

B. Exhaust Ducts Exposed to Outdoor Air: None

C. Outside Air Intake Ducts:
   1. Flexible Glass Fiber Duct Insulation: 2 inches thick.

D. Supply Ducts:
   1. Minimum installed R-value of 5 for ducts located inside the building. (Nominal 2" thick.)

E. Return Ducts:
   1. Minimum installed R-value of 5 for ducts located within the building.

END OF SECTION

SECTION 15129

METERS AND GAGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

C. Static pressure gages.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.

B. ASTM E 1 - Standard Specification for ASTM Thermometers; 2007.

C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc.; 2005.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

A. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.

2.02 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

2.03 STEM TYPE THERMOMETERS

A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: 3/4 inch NPT brass.
   4. Accuracy: 2 percent, per ASTM E 77.

5. Calibration: Degrees F.

2.04 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

2.05 STATIC PRESSURE GAGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.

C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Extend nipples to allow clearance from insulation.

D. Install thermometers in piping systems in thermowells. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Locate test plugs where indicated.

END OF SECTION

SECTION 15145

PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.

1.02 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).

D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

E. ASTM B 32 - Standard Specification for Solder Metal; 2004.

F. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.

G. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.

H. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004.

I. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2008.

J. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2002).

K. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2006.

L. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

M. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005.

N. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2004.

O. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with City of Bryan, standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 REGULATORY REQUIREMENTS

A. Conform to 2003 International Plumbing code for installation of backflow prevention devices.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D 2665 or ASTM D 3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.03 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

2.04 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

2.05 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
   1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
   2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.06 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
   8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
   11. Vertical Support: Steel riser clamp.
   12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange,

and concrete pier or steel support.

13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.07 BALL VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Substitutions: Not permitted.

B. Construction, 4 inches and smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

H. Provide access where valves and fittings are not exposed.

I. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

Q. Install water piping to ASME B31.9.

R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

S. Sleeve pipes passing through partitions, walls and floors.

T. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Provide copper plated hangers and supports for copper piping.
   9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 15072.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install ball valves for throttling, bypass, or manual flow control services.

E. Provide pressure reducing valves where incoming static line pressure is above 65 psig.

3.04 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.06 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved water meter with by-pass valves, pressure reducing valve if required.
   1. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

3.07 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe size: 1/2 inches to 1-1/4 inches:
         1) Maximum hanger spacing: 6.5 ft.
         2) Hanger rod diameter: 3/8 inches.
      b. Pipe size: 1-1/2 inches to 2 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 3/8 inch.
      c. Pipe size: 2-1/2 inches to 3 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 1/2 inch.
      d. Pipe size: 4 inches to 6 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 5/8 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum hanger spacing: 6 ft.
         2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 15146

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Backflow preventers.

F. Water hammer arrestors.

G. Interceptors.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).

B. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2006.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors and other plumbing items.

F. Operation Data: Indicate frequency of treatment required for interceptors.

G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.05 EXTRA MATERIALS

A. Supply for City of Bryan's use in maintenance of project:
   1. Two loose keys for outside hose bibbs.
   2. Two hose end vacuum breakers for hose bibbs.

PART 2 PRODUCTS

2.01 DRAINS

A. Manufacturers:
   1. Josam Company: www.josam.com.
   2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   3. Zurn Industries, Inc: www.zurn.com.

4. Mifab
5. Substitutions: Not permitted.

B. Floor Drain :
1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, and round, adjustable stainless steel strainer.

2.02 CLEANOUTS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Mifab
5. Substitutions: Not permitted.

B. Cleanouts at Exterior Surfaced Areas (CO-1):
1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas (CO-3):
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (CO-4):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.03 WATER HAMMER ARRESTORS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Mifab
5. Substitutions: Not permitted.

B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks flush valve water closets or group of water closets.

END OF SECTION

SECTION 15182

HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. Heating water piping system.
   2. Chilled water piping system.
   3. Equipment drains and overflows.

B. Valves:
   1. Gate valves.
   2. Ball valves.

1.02 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

G. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2007.

H. ASTM B 32 - Standard Specification for Solder Metal; 2004.

I. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.

J. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.

K. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.

L. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2005.

M. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.

N. ASTM D 2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2006.

O. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2002).

P. AWWA C606 - Standard Specification for Grooved and Shouldered Joints; American Water Works Association; 2006.

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

D. Use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Use globe or ball valves for throttling, bypass, or manual flow control services.

F. Use lug end butterfly valves to isolate equipment.

G. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Welders Certificate: Include welders certification of compliance with ASME (BPV IX).

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Certify in accordance with ASME (BPV IX).

1.06 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Grooved mechanical joints may be used in accessible locations only.
   a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Engineer.
   b. Use rigid joints unless otherwise indicated.
4. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated and as follows:
1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
2. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

E. Welding Materials and Procedures: Conform to ASME (BPV IX).

2.02 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black, using one of the following joint types:
1. Welded Joints: ASTM A 234/A 234M, wrought steel welding type fittings; AWS D1.1 welded.
2. Threaded Joints: ASTM B 16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
4. Fittings: ASTM B 16.3, malleable iron or ASTM A 234/A 234M, wrought steel welding type fittings.
5. Joints: Threaded, or AWS D1.1 welded.

2.03 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black; using one of the following joint types:
1. Welded Joints: ASTM A 234/A 234M, wrought steel welding type fittings; AWS D1.1 welded.
2. Threaded Joints: ASTM B 16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
4. Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, wrought steel welding type.
5. Joints: Threaded or AWS D1.1 welded.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube (Exhibit hall only): ASTM B 88 (ASTM B 88M), Type K (A), drawn; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
3. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

B. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR 21 or 26.

1. Fittings: ASTM D 2466 or D2467, PVC.
2. Joints: Solvent welded.

2.05 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

C. Vertical Support: Steel riser clamp.

D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.06 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:
1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:
1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Gaskets: 1/16 inch thick preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Malleable iron or ductile iron, galvanized.
3. Housing Clamps: Malleable iron to engage and lock, designed to permit some angular deflection, contraction, and expansion.
4. Gasket Material: EPDM suitable for operating temperature range from -30 degrees F to 230 degrees F.
5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
6. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union or waterway fitting with water impervious isolation barrier and one galvanized or plated steel end and one copper tube end, end types to match pipe joint types used.

2.07 GATE VALVES

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: Not permitted.

B. Up To and Including 2 Inches:
1. Bronze body, bronze trim, screwed bonnet, non-rising stem, handwheel, inside screw, solid wedge disc, alloy seat rings, solder or threaded ends.

C. Over 2 Inches:
1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

2.08 GLOBE OR ANGLE VALVES

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 2 Inches:
   1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat, solder ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.09 BALL VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 2 Inches:
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends with union.

C. Over 2 Inches:
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

2.10 SWING CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 2 Inches:
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.11 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com.
   2. Griswold Controls: www.griswoldcontrols.com.
   3. Taco, Inc: www.taco-hvac.com.

B. Construction: Class 125, Brass or bronze body with union on inlet, temperature and pressure test plug on inlet and outlet.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 5 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 15189 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 15122.

I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   6. Provide copper plated hangers and supports for copper piping.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

K. Provide access where valves and fittings are not exposed.

L. Use eccentric reducers around pumps to maintain top of pipe level.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

N. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.
   1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.
10. 10 inches: Maximum span, 20 feet; minimum rod size, 3/4 inch.
11. 12 inches: Maximum span, 23 feet; minimum rod size, 7/8 inch.

END OF SECTION

SECTION 15183

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air vents.

B. Pump suction fittings.

C. Combination fittings.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

C. Project Record Documents: Record actual locations of flow meters.

D. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 AIR VENTS

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Taco, Inc; Model 409 Vent: www.taco-hvac.com.

B. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.02 SUCTION DIFFUSERS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com.
   2. Anvil International, Inc: www.anvilintl.com.
   3. Victaulic Company of America: www.victaulic.com.
   4. Taco

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and

larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

2.03 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:
   1. Crane Co.: www.cranevalve.com.
   2. Taco, Inc: www.taco-hvac.com.
   3. Victaulic Company of America: www.victaulic.com.
   4. Bell & Gossett

B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Existing expansion tanks and air seperators to be reused. Verify integrity of these devices by hydro-static test prior to re-use.

C. Connect new piping to existing components.

D. Provide manual air vents at system high points and as indicated.

E. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

F. Provide air separator on suction side of system circulation pump and connect to existing expansion tank.

G. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.

H. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.

I. Support pump fittings with floor mounted pipe and flange supports.

J. Pipe relief valve outlet to nearest floor drain.

K. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

END OF SECTION

SECTION 15188

HVAC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Base mounted pumps.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

B. UL 778 - Standard for Motor-Operated Water Pumps; Underwriters Laboratories Inc.; 2002.

1.03 PERFORMANCE REQUIREMENTS

A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

E. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 QUALITY ASSURANCE

A. Alignment: Base mounted pumps shall be aligned by qualified millwright.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL 778 as suitable for the purpose specified and indicated.

1.07 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Pumps Inc: www.armstrongpumps.com.

B. ITT Bell & Gossett: www.bellgossett.com.

C. Sterling Fluid Systems: www.sterlingfluid.com.

D. Taco

2.02 HVAC PUMPS - GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2.03 BASE MOUNTED PUMPS

A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for 125 psi maximum working pressure.

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed to shaft.

D. Bearings: Permanently lubricated roller or ball bearings.

E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F. Drive: Flexible coupling with coupling guard.

G. Baseplate: Cast iron or fabricated steel with integral drain rim.

H. Performance: See drawings

I. Electrical Characteristics: See drawings
   1. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and pump suction fitting on pump suction, and line sized combination pump discharge valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Check, align, and certify alignment of base mounted pumps prior to start-up.

H. Install base mounted pumps on existing concrete housekeeping base, with anchor bolts, set and level, and grout in place.

I. Lubricate pumps before start-up.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Electric water coolers.

1.02 REFERENCE STANDARDS

A. ARI 1010 - Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers; Air-Conditioning and Refrigeration Institute; 2002.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).

C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2003.

E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2001 (R2004).

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in City of Bryan's name and registered with manufacturer.

1.04 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 WARRANTY

A. Provide five year manufacturer warranty for electric water cooler.

1.07 EXTRA MATERIALS

A. Supply two flush valve service kits.

PART 2 PRODUCTS

2.01 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, floor mounted, siphon jet flush action, china bolt caps.
   1. Flush Volume: 1.6 gallon, maximum.
   2. Flush Valve: Exposed (top spud).
   3. Flush Operation: Manual, oscillating handle.
   4. Manufacturers:
      a. American Standard Inc: www.americanstandard.com.
      b. Toto
      c. Kohler Company: www.kohler.com.
      d. Substitutions: Not permitted.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
   2. ASME A112.19.2; wall hung, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps.
   3. ASME A112.19.2M; floor mounted, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps.

C. Manufacturers:
   1. Sloan Valve Company: www.sloanvalve.com.
   2. Toto

D. Exposed Flush Valve:
   1. ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. (Sloan Royal)

E. Concealed Flush Valve:
   1. ASME A112.18.1; concealed rough brass, diaphragm type with exposed chrome plated push button and escutcheon, screw driver stop and vacuum breaker; maximum 1.6 gallon flush volume.

F. Sensor Operated Flush Valve:
   1. ASME A112.18.1; exposed, nickel chrome plated, diaphragm type with low voltage operated solenoid operator, infrared sensor and over-ride button, and vacuum breaker; maximum 1.6 gallon flush volume. Brass piston valve with stainless self-cleaning desbris screen.

G. Seats:
   1. Manufacturers:
      a. Bemis Manufacturing Company: www.bemismfg.com.
      b. Church Seat Company: www.churchseats.com.
      c. Toto
      d. Olsonite: www.olsonite.com.
      e. Substitutions: Not permitted.
   2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

H. Water Closet Carriers:
   1. Manufacturers:
      a. JOSAM Company: www.josam.com.

b. Sloan Valve Company: www.sloanvalve.com.
c. Zurn Industries, Inc: www.zurn.com.
d. Substitutions: Not permitted.

2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.02 LAVATORIES

A. Lavatory Manufacturers:
1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Toto
4. Substitutions: Not permitted.

B. Vitreous China Wall Hung Basin:
1. ASME A112.19.2M; vitreous china wall hung lavatory with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.

C. Vitreous China Counter Top Basin:
1. ASME A112.19.2M; vitreous china self-rimming counter top lavatory with drillings on 4 inch centers, front overflow, seal of putty, calking, or concealed vinyl gasket.

D. Supply Faucet Manufacturers:
1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Toto
4. Substitutions: Not permitted.

E. Supply Faucet:
1. ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow), single lever handle.

F. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Screwdriver stops.
4. Flexible supplies.

2.03 SINKS

A. Sink Manufacturers:
1. Eljer, Inc: www.eljer.com.
2. Just Manufacturing Company: www.justmfg.com
3. Substitutions: Not permitted.

B. Single Compartment Bowl:
1. ASME A112.19.3M; 20 gage thick, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
a. Drain: 3-1/2 inch crumb cup and tailpiece.

C. Trim: As specified on the schedule.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, screwdriver stop, flexible supplies.

2.04 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:
1. Tri Palm International/Oasis: www.tripalmint.com.
2. Elkay Manufacturing Company: www.elkay.com.

3. Haws Corporation: www.hawsco.com.
4. Substitutions: Not permitted.

B. Fountain:
1. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

C. Do not permit use of fixtures.

END OF SECTION

SECTION 15411

PREFABRICATED TUBS AND SHOWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gelcoated fiberglass shower units.

B. Acrylic faced fiberglass shower units.

C. Grab bars, shower seats, and other accessories.

D. Mixing valve and shower fittings.

1.02 REFERENCES

A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2004.

B. ANSI Z124.1 - American National Standard for Plastic Bathtub Units; 1995.

C. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.

D. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 1985 (Reapproved 2004).

E. HUD UMB 73a - Building Product Standards and Certification Program for Plastic Bathroom Fixtures; 1984.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

PART 2 PRODUCTS

2.01 TUB AND SHOWER UNITS

A. Manufacturers:
   1. Aqua Glass Corporation: www.aquaglass.com.
   2. Jacuzzi: www.jacuzzi.com.
   3. Best Bath
   4. Kohler Company: www.kohlerco.com.
   5. Substitutions: Not permitted.

B. Shower Units: Gelcoated molded fiberglass one-piece three-sided units, with integral shower pan; front and top edges returned to meet wall construction.
   1. Size: 39 inches wide by 38 inches deep by 73 inches high overall; one-piece unit with sill less than 2 inches high.
      a. Grab Bars: L-shaped bar full width of control wall and minimum 16 inches width on back wall.
   2. Color: White.

C. Shower Units: Acrylic faced molded fiberglass units, with integral shower pan and molded ceiling; front face formed to overlap wall construction.
   1. Size: 36 inches wide by 36 inches deep by 73 inches high overall; one-piece unit with sill less than 6 inches high.

a. Grab Bars: L-shaped bar full width of control wall and minimum 16 inches width on back wall; vertical bar at entry, 24 inches high.

2. Color: White.

2.02 MATERIALS

A. Molded Fiberglass Units: Minimum 15 percent fiberglass content, cellular inner core, reinforced polyester outer coating; complying with ANSI Z124.1.2.

1. Certified by NAHB to meet the requirements of HUD Use of Materials Bulletin 73a.
2. Surface Burning Characteristics: Flame spread index less than 200; smoke developed index less than 450; when tested in accordance with ASTM E 84 or NFPA 255 (Class C).
3. Gelcoated Finish: Sanitary grade polyester gelcoat, high gloss; containing antibacterial inhibitor.
4. Acrylic Finish: Vacuum-formed acrylic sheet, one-piece, high gloss.
5. Reinforcement for Grab Bars and Wall-Mounted Accessories: Factory-installed minimum 3 by 3 inch steel mounting plates anchored to 3/4 inch thick plywood fiberglassed into walls in manner required to meet load resistance requirements of ASTM F 446.
6. Reinforcement for Future Grab Bars: Provide continuous 3/4 inch thick plywood fiberglassed into all three sides, complying with ASTM F 446, Uniform Federal Accessibility Standards, and HUD requirements.
7. Wood base supporting bottom of unit, attached with fiberglass coating and covered by polyester outer coating.
8. Self-caulking chrome-plated brass drain.

B. Grab Bars: Type 304 stainless steel; configuration complying with ANSI A117.1, ADAAG, and ASTM F 446.

1. Size: 1-1/2 inch diameter tube, 18 gage wall thickness.
2. Mounting: Concealed stainless steel bolts and nuts, with escutcheon of same finish as bar.
3. Height: Horizontal bars 36 inches above floor; vertical bars centered at 42 inches above floor.
4. Finish: Stainless steel.

C. Folding Shower Seat: Stainless steel frame with phenolic core laminated plastic slats, simulated teak pattern; frame spring-hinged to allow seat to fold up against wall.

D. Shower Spray and Control Valve: Pressure-balancing thermostatically controlled valve, with lever handle on-off valve; hand-held shower spray, 60 inch hose, vacuum breaker, and 24 inch slide bar; bright chrome plated.

E. Shower Curtain Rod: Type 304 stainless steel tube, 1 inch outside diameter, 20 gage wall thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 15622

AIR COOLED WATER CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chiller package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Chilled water connections.

E. Starters.

1.02 REFERENCE STANDARDS

A. ARI 550/590 - Standard for Water Chilling Packages Using the Vapor Compression Cycle; Air-Conditioning and Refrigeration Institute; 2003.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

C. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

1.03 PERFORMANCE REQUIREMENTS - See Drawings

A. Disconnect Switch: Factory mount disconnect switch in control panel.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.

D. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

E. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in City of Bryan's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.07 WARRANTY

A. Provide a five year warranty to include coverage for compressor including materials only.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation; Model RAP: www.carrier.com.

B. Trane Inc: www.trane.com.

C. YORK: www.york.com.

D. McQuay.

E. Substitutions: Not Permitted.

2.02 MANUFACTURED UNITS

A. Provide factory assembled and tested single or factory configured duplex chassis outdoor air cooled liquid chillers consisting of compressors, condenser, evaporator, thermal expansion valve, refrigeration accessories, and control panel. Construction, testing, and ratings shall be in accordance with ARI 550/590.

B. Refrigerant shall be HFC-134a.

C. Conform to ASME (BPV VIII, 1) Boiler and Pressure Vessel Code for construction and testing of reciprocating water chillers.

D. Conform to ASHRAE Std 15 for construction and operation of water chillers.

E. Energy Efficiency for air-cooled units:

2.03 HERMETIC COMPRESSORS

A. Scroll Compressors:
   1. Unit: Direct drive, hermetic, 3600 RPM, fixed compression, scroll motor-compressor with control panel.
   2. Features: Centrifugal oil pump, sump oil heater, oil level sight glass, oil charging valve, two point lubrication for each motor bearing, flooded lubrication for the journal and thrust bearings, check valve on scroll discharge port.
   3. Motor: Suction gas cooled, hermetically sealed, squirrel cage induction.
   4. Controls:
      a. Starter section:
         1) Single point power connection and grounding lug.
         2) Control power transformer with fuse.
         3) Solid state overload relay for each compressor.
         4) Phase loss/reversal monitor.
      b. Refrigeration section:
         1) Anti-recycle timer.
         2) Reset relay.
         3) Low and high pressure control.
      c. Manual reset for compressor overload, high motor temperature, and low and high refrigerant pressure.
   5. Automatic Capacity Reduction: Wire steps to terminal strip, refer to Section 15940.

2.04 EVAPORATOR

A. Provide mechanically cleanable shell and tube type evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Provide multiple refrigerant circuits on multiple compressor units.

B. Design, test, and stamp refrigerant side for 220 psig working pressure and water side for 150

psig working pressure, in accordance with ASME (BPV VIII, 1).

C. Insulate with 0.75 inch minimum thick flexible expanded polyvinyl chloride insulation with maximum K value of 0.28. Provide heat tape to protect evaporator to 0 degrees F.

D. Heads to be removeable with drains and vents.

2.05 CONDENSERS

A. Construct condenser coils of aluminum fins mechanically bonded to seamless copper tubing. Provide integral sub-cooling circuits with liquid accumulators. Air test under water to 450 psig.

B. Provide vertical discharge direct driven air foil type condenser fans with fan guard on discharge. Provide factory mounted, louvered, galvanized steel coil guard panels with lint screens.

2.06 ENCLOSURES

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters and disconnects in NEMA 4X weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

2.07 REFRIGERANT CIRCUIT

A. Provide for each refrigerant circuit:
   1. Filter dryer (replaceable core type).
   2. Liquid line sight glass and moisture indicator.
   3. Electronic thermal expansion valve sized for maximum operating pressure.
   4. Oil separator.
   5. Insulated suction line.
   6. Discharge line check valve.
   7. Compressor discharge service valve.
   8. Condenser pressure relief valve.
   9. Refrigerant economizer

2.08 CONTROLS

A. On chiller, mount NEMA 4X weatherproof steel control panel, containing starters power and control wiring,non-fused disconnect, factory wired with single point power connection.

B. For each compressor, provide across-the-line starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection.

C. Provide safety controls arranged so any one will shut down machine and require manual reset: Each of these can be displayed in the standard display module in plain language.
   1. Low chilled water temperature switch.
   2. Reverse rotation.
   3. Voltage imbalance.
   4. Ground current fault.
   5. Thermal overload.
   6. Electrical overload.
   7. Loss of phase.
   8. High discharge pressure switch for each compressor.
   9. Low suction pressure switch for each compressor.
   10. Oil pressure switch.
   11. Flow switch in chilled water line.

D. Provide operating controls:

1. Capacity control based on leaving chilled water temperature and compensated by by rate of change of return temperature.
2. Limiting chilled water temperatre pull-down rate at start-up to prevent excessive demand spikes at start-up.
3. Seven day time schedule.
4. Demand limit control with 2-stage control.
5. Chiller pump start/stop control.
6. Dual chiller control for parallel chiller applications.
7. Auto-restart after power failure.
8. A portable 4 line display module in NEMA 4X housing.

E. For multiple units, provide sequence panel to allow operation in parallel with lead-lag switching.

F. Chiller System Manager Multi-Unit Controller:
1. Field installed.
2. Sequence between 2 and eight chillers in parallel in a single system.
3. Control system shall control chiller and chilled water pumps.

G. Factory installed GFCI convenience outlet utilizing a field installed step-down transformer.

H. Provide interface card to interface with TAC Controls controller.

I. Provide under-voltage monitoring that communicates with the chiller controller to set an alarm and shut down the unit upon detection of a under-voltage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units on vibration isolation. Refer to Section 15072.

C. Connect to electrical service. Refer to Section 16155.

D. Connect to chilled water piping. Refer to Section 15182.
1. On inlet, provide:
   a. Thermometer well for temperature controller.
   b. Flexible pipe connector.
   c. Shut-off valve.
2. On outlet, provide:
   a. Flexible pipe connector.
   b. Triple duty valve

E. Arrange piping for easy dismantling to permit tube cleaning.

3.02 SYSTEM STARTUP

A. Supply service of factory trained representative to supervise testing, dehydration and charging of machine, start-up, and instruction on operation and maintenance to City of Bryan.

B. Supply initial charge of refrigerant and oil.

C. Demonstrate system operation and verify specified performance. Refer to Section 15950.

3.03 SCHEDULES - See Drawings

END OF SECTION

SECTION 15720

AIR HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged air handling units.

1.02 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2000).

B. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.

C. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2005.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.

F. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.

G. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; Air Conditioning and Refrigeration Institute; 2001 (R2002) .

H. ARI 430 - Standard for Central-Station Air-Handling Units; Air-Conditioning and Refrigeration Institute; 1999.

I. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.; 2004.

1.03 SUBMITTALS

A. Product Data:
   1. Published Literature: Indicate dimensions, weights, capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
   5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

B. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Include installation instructions.

D. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

E. Maintenance Materials: Furnish the following for City of Bryan's use in maintenance of project.
   1. See Section 01600 - Product Requirements, for additional provisions.
   2. Extra Fan Belts: One set for each unit.

3. Extra Filters: One set for each unit.

1.04 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.06 EXTRA MATERIALS

A. Supply one set for each unit of fan belts.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation: www.carrier.com.

B. Trane Inc: www.trane.com.

C. YORK: www.york.com.

D. Substitutions: Not permitted. Prior to approval of manufacurers other than the one specified, in the drawings, the following is required:
   1. Complete layout of the ductwork and units including all plans and sections shown on the design drawings showing the proposed equipment.
   2. Side by side listing of electrical and hydronic requirements of both the as-designed units and the proposed equipment.
   3. Substitution of equipment without this prior approval will be rejected.

2.02 GENERAL DESCRIPTION

A. Configuration: Fabricate with fan plus accessories, including:
   1. Cooling coil section.
   2. Heating coil section.
   3. Combination filter/mixing box section.
   4. Multi-zone damper section.

B. Fabrication: Conform to AMCA 99 and ARI 430.

2.03 CASING

A. Construction: Fabricate on channel base and drain pan of welded steel. Assemble sections with gaskets and bolts.
   1. Outside Casing:
      a. Galvanized Steel: 0.0516 inch.
      b. Finish: Manufacturers standard paint on exterior.
   2. Inside Casing:
      a. Galvanized Steel: Solid, 0.0276 inch thick.
   3. Floor Plate:
      a. Galvanized Steel: 0.138 inch thick.

B. Insulation: Neoprene coated, glass fiber, applied to internal surfaces with adhesive and weld pins with exposed edges of insulation coated with adhesive.
   1. "K" value at 75 degrees F: Maximum 0.26 Btuh/inch/sq ft/degrees F.
   2. Density: 1 inch thick, 1-1/2 lbs/cu ft.

C. Finish: Baked enamel.

D. Inspection Doors: 18 x 22 inch of galvanized steel for flush mounting, with gasket, latch, and handle assemblies and 12 x 12 inch inspection window of 1/4 inch thick acrylic sheet. Provide welded channel frame to set door out from casing to permit external insulation.

E. Drain Pans: Construct from single thickness galvanized steel with insulation between layers with welded corners. Cross break and pitch to drain connection. Provide drain pans under fan section.

F. Louvers: Adjustable, of galvanized steel, 4 inch deep with plenum, nylon bearings, 1/2 inch mesh, 0.04 inch galvanized wire bird screen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500-L. Furnish adjustable louvers with hollow vinyl bulb edging on blades and foam side stops to limit leakage to maximum 2 percent at 4 inch wg differential pressure when sized for 2000 fpm face velocity.

2.04 FANS

A. Type: Forward curved, single width, single inlet, centrifugal plug type fan.

B. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.

D. Bearings: Self-aligning, grease lubricated, ball or roller bearings with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.

E. Mounting: Locate fan and motor internally on welded steel base coated with corrosion resistant paint. Factory mount motor on slide rails. Provide access to motor, drive, and bearings through removable casing panels or hinged access doors. Mount base on vibration isolators; refer to Section 15072.

F. Flexible Duct Connections: For separating fan and coil, and adjacent sections; refer to Section 15820.

2.05 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, self-aligning, grease-lubricated ball bearings, with ABMA 9 L-10 life at 50,000 hours.

B. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

C. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.06 COILS

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends fully contained within casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high.

C. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

D. Fabrication:
   1. Tubes: Seamless copper expanded into fins, brazed joints.
   2. Fins: Aluminum.
   3. Casing: Die formed channel frame of galvanized steel.

E. Water Heating Coils:
   1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
   2. Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

F. Water Cooling Coils:
   1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
   2. Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.

2.07 FILTERS

A. Filter Box: Section with filter guides, access doors from both sides, for side loading with gaskets and blank-off plates.

B. Filter Media: UL 900 listed, Class I or Class II, approved by local authorities.

C. Flat: 2 inches deep disposable panel filters. Refer to Section 15860.

D. Filter Gages:
   1. 3-1/2 inch diameter diaphragm actuated dial in metal case with static pressure tips.

2.08 DAMPERS

A. Mixing Boxes: Section with factory mounted outside and return air dampers of galvanized steel with vinyl bulb edging and edge seals in galvanized frame, with galvanized steel axles in self-lubricating nylon bearings, in parallel blade arrangement. Provide removable, full width rack for supporting freeze protection thermostat, with removable end panel to permit rack removal.

B. Damper Leakage: Maximum 2 percent at 4 inch wg differential pressure when sized for 2000 fpm face velocity.

C. Multi-Zone Dampers: Factory mount in casing with service door, of galvanized steel blades with vinyl bulb edging and edge seals and frame with 1/2 inch (13 mm) diameter stainless steel shaft in oil impregnated bronze bearings, with end stops in frame; arrange for parallel blade operation, with adjustable resistance plates, hand quadrants, and sheet metal clips for duct connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets.

C. Isolate fan section with flexible duct connections.

D. Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Install assembled unit on vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads.

F. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
   3. Locate water supply at bottom of supply header and return water connection at top.
   4. Provide manual air vents at high points complete with stop valve.
   5. Ensure water coils are drainable and provide drain connection at low points.

G. Insulate coil headers located outside air flow as specified for piping. Refer to Section 15082.

END OF SECTION

SECTION 15810

DUCTS

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Metal ductwork.

B. Casing and plenums.

C. Duct cleaning.

2.02 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2005.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

D. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1985, First Edition.

E. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

2.03 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

2.04 SUBMITTALS

A. Product Data: Provide data for duct materials.

B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for low pressure class and higher systems.

C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

D. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

2.05 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

2.06 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

3.01 DUCT ASSEMBLIES

3.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

B. Insulated Flexible Ducts:
   1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
      a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
      b. Maximum Velocity: 4000 fpm.
      c. Temperature Range: -20 degrees F to 210 degrees F.

C. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

3.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. T's, bends, and elbows: Construct according to SMACNA (DCS).

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

F. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

3.04 DUCT MANUFACTURERS

A. Metal-Fab, Inc: www.mtlfab.com.

B. SEMCO Incorporated: www.semcoinc.com.

C. United McGill Corporation: www.unitedmcgill.com.

D. Substitutions: Not permitted.

3.05 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

3.06 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and

Flexible, and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

D. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

PART 3 EXECUTION

4.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. Install and seal metal and flexible ducts along all longitudinal seams on rigid ducts and transverse seams on all ducts using UL 181A or 181B tapes and mastics in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

I. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

J. Connect flexible ducts to metal ducts with draw bands.

K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

L. At exterior wall louvers, seal duct to louver frame.

4.02 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

4.03 SCHEDULES

A. Ductwork Material:

1. Low Pressure Supply (Heating Systems): Steel
2. Low Pressure Supply (System with Cooling Coils): Steel.
3. Return and Relief: Steel, Aluminum.
4. General Exhaust: Steel, Aluminum.
5. Outside Air Intake: Steel.
6. Combustion Air: Steel.

B. Ductwork Pressure Class:
1. Supply (Heating Systems): 1 inch
2. Supply (System with Cooling Coils): 2 inch.
3. Return and Relief: 1 inch.
4. General Exhaust: 1/2 inch.
5. Outside Air Intake: 1/2 inch.

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Duct test holes.

D. Flexible duct connections.

E. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.03 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

1.07 EXTRA MATERIALS

A. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
   1. Krueger: www.krueger-hvac.com.
   2. Ruskin Company: www.ruskin.com.
   3. Titus: www.titus-hvac.com.
   4. Substitutions: Not permitted.

B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com.
   2. Nailor Industries Inc: www.nailor.com.
   3. Ruskin Company: www.ruskin.com.
   4. Manufacturer of equipment when backdraft device is integral to the equipment.
   5. Substitutions: Not permitted.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.05 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com.
   2. Nailor Industries Inc: www.nailor.com.
   3. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15810 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct test holes where indicated and required for testing and balancing purposes.

D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 15072.

F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

G. Use splitter dampers only where indicated.

H. Provide balancing dampers on high velocity systems where indicated.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 15835

POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cabinet exhaust fans.

1.02 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.

B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2005.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.

F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2008.

G. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; 2006.

1.03 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 QUALITY ASSURANCE

A. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 FIELD CONDITIONS

1.06 EXTRA MATERIALS

A. Supply two sets of belts for each fan.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. Substitutions: Not permitted.

2.02 POWER VENTILATORS - GENERAL

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 CABINET AND CEILING EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Hung Cabinet Fans:
   1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 15072.
   2. Install flexible connections specified in Section 15820 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

3.02 SCHEDULES - See Drawings

END OF SECTION

SECTION 15850

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

1.02 REFERENCE STANDARDS

A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council; 1984.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.

C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

B. Samples: Submit one of each required air outlet and inlet type.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Krueger: www.krueger-hvac.com.

B. Price Industries: www.price-hvac.com.

C. Titus: www.titus-hvac.com.

D. Metal-Aire: www.metalaire.com.

E. Pottorff: www.pottorff.com.

F. Substitutions: Not permitted.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with baked enamel off-white finish.

2.03 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with steel frame and baked enamel off-white finish.

2.04 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish, color to be selected.

2.06 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Aluminum with factory clear lacquer finish.

C. Frame: Channel lay-in frame for suspended grid ceilings.

2.07 CEILING LINEAR EXHAUST AND RETURN GRILLES

A. Type: Streamlined blades with 90 degree one-way deflection, 1/8 x 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish, color to be selected.

2.08 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection.

B. Frame: 1-1/4 inch margin with concealed mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

2.09 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with concealed mounting.

C. Fabrication: Steel frames and blades, with factory off-white enamel finish, color to be selected.

2.10 WALL GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Aluminum with factory clear lacquer finish.

C. Frame: 1-1/4 inch margin with countersunk screw mounting.

2.11 LINEAR WALL REGISTERS/GRILLES

A. Type: Streamlined blades with 15 degree deflection, 1/8 x 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin with concealed mounting and gasket.

C. Fabrication: Aluminum extrusions, with factory off-white enamel finish.

2.12 LOUVERS

A. Type: 4 inch deep with blades on 45 degree slope, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

B. Fabrication: 16 gage thick galvanized steel welded assembly, with factory baked enamel finish, color to be selected.

C. Mounting: Furnish with interior angle flange for installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

3.02 SCHEDULES - See Drawings

END OF SECTION

SECTION 15926

DIGITAL CONTROL EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control equipment.

B. Software.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 15928.

C. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

D. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.04 SUBMITTALS

A. Product Data: Provide data for each system component and software module.

B. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.
   4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Indicate description and sequence of operation of operating, user, and application software.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

E. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in City of Bryan s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Correct defective Work within a five year period after Substantial Completion.

B. Provide five year manufacturer's warranty for field programmable micro-processor based units.

1.07 MAINTENANCE SERVICE

A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

B. Provide two complete inspections per year, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

1.08 PROTECTION OF SOFTWARE RIGHTS

A. Prior to delivery of software, the City of Bryan and the party providing the software will enter into a software license agreement with provisions for the following:
   1. Limiting use of software to equipment provided under these specifications.
   2. Limiting copying.
   3. Preserving confidentiality.
   4. Prohibiting transfer to a third party.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. T.A.C. Controls.

B. Substitutions: Not Permitted.

2.02 OPERATOR STATION

A. Work Station: Owner Provided

B. Printer: Owner Provided

2.03 CONTROL UNITS

A. Units: Modular in design and consisting of processor board with programmable RAM memory, local operator access and display panel, and integral interface equipment.

B. Control Units Functions:
   1. Monitor or control each input/output point.
   2. Completely independent with hardware clock/calendar and software to maintain control independently.
   3. Acquire, process, and transfer information to operator station or other control units on network.
   4. Accept, process, and execute commands from other control unit's or devices or operator stations.
   5. Record, evaluate, and report changes of state or value that occur among associated points. Continue to perform associated control functions regardless of status of network.
   6. Perform in stand-alone mode:

a. Start/stop.
b. Duty cycling.
c. Automatic Temperature Control.
d. Event initiated control.
e. Calculated point.
f. Scanning and alarm processing.
g. Trend logging.
h. Global communications.

C. Global Communications:
1. Transmit any or all input/output points onto network for use by other control units and utilize data from other control units.

D. Input/Output Capability:
1. Discrete/digital input (contact status).
2. Discrete/digital output.
3. Analog input.
4. Analog output.

E. Monitor, control, or address data points. Mix shall include analog inputs, analog outputs, pulse inputs, pulse outputs and discrete inputs/outputs, as required. Install control unit's with minimum 30 percent spare capacity.

F. Point Scanning: Set scan or execution speed of each point to operator selected time from 1 to 250 seconds.

G. Upload/Download Capability: Download from or upload to operator station. Upload/Download time for entire control unit database maximum 10 seconds on hard wired LAN, or 60 seconds over voice grade phone lines.

H. Test Mode Operation: Place input/output points in test mode to allow testing and developing of control algorithms on line without disrupting field hardware and controlled environment. In test mode:
1. Inhibit scanning and calculation of input points. Issue manual control to input points (set analog or digital input point to operator determined test value) from work station.
2. Control output points but change only data base state or value; leave external field hardware unchanged.
3. Enable control actions on output points but change only data base state or value.

I. Local display and adjustment panel: Portable or Integral to control unit, containing digital display, and numerical keyboard. Display and adjust:
1. Input/output point information and status.
2. Controller set points.
3. Controller tuning constants.
4. High and low limit values.
5. Limit differential.
6. Set/display date and time.
7. Control outputs connected to the network.
8. Automatic control outputs.
9. Perform control unit diagnostic testing.
10. Points in "Test" mode.

2.04 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.05 OPERATING SYSTEM SOFTWARE

A. Input/Output Capability From Operator Station:
   1. Request display of current values or status in tabular or graphic format.
   2. Command selected equipment to specified state.
   3. Initiate logs and reports.
   4. Change analog limits.
   5. Add, delete, or change points within each control unit or application routine.
   6. Change point input/output descriptors, status, alarm descriptors, and engineering unit descriptors.
   7. Add new control units to system.
   8. Modify and set up maintenance scheduling parameters.
   9. Develop, modify, delete or display full range of color graphic displays.
   10. Automatically archive select data even when running third party software.
   11. Provide capability to sort and extract data from archived files and to generate custom reports.
   12. Select daily, weekly or monthly as scheduled frequency to synchronize time and date in digital control units. Accommodate daylight savings time adjustments.
   13. Print selected control unit data base.

B. Operator System Access: Via software password with minimum 5 access levels at work station and minimum 3 access levels at each control unit.

C. Data Base Creation and Support: Changes shall utilize standard procedures. Control unit shall automatically check work station data base files upon connection and verify data base match. Minimum capability shall include:
   1. Add and delete points.
   2. Modify any point parameter.
   3. Change, add, or delete English language descriptors.
   4. Add, modify, or delete alarm limits.
   5. Add, modify, or delete points in start/stop programs, trend logs, etc.
   6. Create custom relationship between points.
   7. Create or modify DDC loops and parameters.
   8. Create or modify override parameters.
   9. Add, modify, and delete any applications program.
   10. Add, delete, develop, or modify dynamic color graphic displays.

D. Dynamic Color Graphic Displays:
   1. Utilizes custom symbols or system supported library of symbols.
   2. Sixteen (16) colors.
   3. Sixty (60) outputs of real time, live dynamic data per graphic.
   4. Dynamic graphic data.
   5. Modify graphic screen refresh rate between 1 and 60 seconds.

E. Operator Station:
   1. Accept data from LAN as needed without scanning entire network for updated point data.
   2. Interrogate LAN for updated point data when requested.
   3. Allow operator command of devices.
   4. Allow operator to place specific control units in or out of service.
   5. Allow parameter editing of control units.
   6. Store duplicate data base for every control unit and allow down loading while system is on line.
   7. Control or modify specific programs.
   8. Develop, store and modify dynamic color graphics.
   9. Provide data archiving of assigned points and support overlay graphing of this data utilizing up to four (4) variables.

F. Alarm Processing:
   1. Off normal condition: Cause alarm and appropriate message, including time, system, point descriptor, and alarm condition. Select alarm state/value and which alarms shall cause automatic dial-out.
   2. Critical alarm or change-of-state: Display message, stored on disk for review and sort, or print.
   3. Print on line changeable message, up to 60 characters in length, for each alarm point specified.
   4. Display alarm reports on video. Display multiple alarms in order of occurrence.
   5. Define time delay for equipment start-up or shutdown.
   6. Allow unique routing of specific alarms.
   7. Operator specifies if alarm requires acknowledgement.
   8. Continue to indicate unacknowledged alarms after return to normal.
   9. Alarm notification:
      a. Automatic print.
      b. Display indicating alarm condition.
      c. Selectable audible alarm indication.

G. Event Processing: Automatically initiate commands, user defined messages, take specific control actions or change control strategy and application programs resulting from event condition. Event condition may be value crossing operator defined limit, change-of-state, specified state, or alarm occurrence or return to normal.

H. Automatic Restart: Automatically restart field equipment on restoration of power. Provide time delay between individual equipment restart and time of day start/stop.

I. Messages:
   1. Automatically display or print user-defined message subsequent to occurrence of selected events.
   2. Compose, change, or delete any message.
   3. Display or log any message at any time.
   4. Assign any message to any event.

J. Reports:
   1. Manually requested with time and date.
   2. Long term data archiving to hard disk.
   3. Automatic directives to download to transportable media such as floppy diskettes for storage.
   4. Data selection methods to include data base search and manipulation.
   5. Data extraction with mathematical manipulation.
   6. Data reports shall allow development of XY curve plotting, tabular reports (both statistical and summary), and multi-point timed based plots with not less than four (4) variables displayed.

7. Generating reports either normally at operator direction, or automatically under work station direction.
8. Reports may either manually displayed or printed, or may be printed automatically on daily, weekly, monthly, yearly or scheduled basis.
9. Include capability for statistical data manipulation and extraction.
10. Provide capability to generate four types of reports: Statistical detail reports, summary reports, trend graphic plots, x-y graphic plots.

K. Parameter Save/Restore: Store most current operating system, parameter changes, and modifications on disk or diskette.

L. Data Collection:
1. Automatically collect and store in disk files.
2. Daily electrical energy consumption, peak demand, and time of peak demand for up to electrical meters over 2 year period.
3. Provide archiving of stored data for use with system supplied custom reports.

M. Graphic Display: Support graphic development on work station with software features:
1. Page linking.
2. Generate, store, and retrieve library symbols.
3. Single or double height characters.
4. Sixty (60) dynamic points of data per graphic page.
5. Pixel level resolution.
6. Animated graphics for discrete points.
7. Analog bar graphs.
8. Display real time value of each input or output line diagram fashion.

N. Maintenance Management:
1. Run time monitoring, per point.
2. Maintenance scheduling targets with automatic annunciation, scheduling and shutdown.
3. Equipment safety targets.
4. Display of maintenance material and estimated labor.
5. Target point reset, per point.

O. Advisories:
1. Summary which contains status of points in locked out condition.
2. Continuous operational or not operational report of interrogation of system hardware and programmable control units for failure.
3. Report of power failure detection, time and date.
4. Report of communication failure with operator device, field interface unit, point, programmable control unit.

2.06 LOAD CONTROL PROGRAMS

A. General: Support inch-pounds and SI (metric) units of measurement.

B. Duty Cycling:
1. Periodically stop and start loads, based on space temperature, and according to various On/Off patterns.
2. Modify off portion of cycle based on operator specified comfort parameters. Maintain total cycle time by increasing on portion of cycle by same amount that off portion is reduced.
3. Set and modify following parameters for each individual load.
   a. Minimum and maximum Off time.
   b. On/Off time in one minute increments.
   c. Time period from beginning of interval until load can be cycled.
   d. Manually override the DCC program and place a load in an On or Off state.
   e. Cooling Target Temperature and Differential.

f. Heating Target Temperature and Differential.
g. Cycle off adjustment.

C. Automatic Time Scheduling:
1. Self-contained programs for automatic start/stop/scheduling of building loads.
2. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary day schedules.
3. Special days schedule shall support up to 30 unique date/duration combinations.
4. Any number of loads assigned to any time program; each load can have individual time program.
5. Each load assigned at least 16 control actions per day with 1 minute resolution.
6. Time schedule operations may be:
   a. Start.
   b. Optimized Start.
   c. Stop.
   d. Optimized Stop.
   e. Cycle.
   f. Optimized Cycle.
7. Minimum of 30 holiday periods up to 100 days in length may be specified for the year.
8. Create temporary schedules.
9. Broadcast temporary "special day" date and duration.

D. Start/Stop Time Optimization:
1. Perform optimized start/stop as function of outside conditions, inside conditions, or both.
2. Adaptive and self-tuning, adjusting to changing conditions unattended.
3. For each point under control, establish and modify:
   a. Occupancy period.
   b. Desired temperature at beginning of occupancy period.
   c. Desired temperature at end of occupancy period.

E. Night Setback/Setup Program: Reduce heating space temperature setpoint or raise cooling space temperature setpoint during unoccupied hours; in conjunction with scheduled start/stop and optimum start/stop programs.

F. Calculated Points: Define calculations and totalization computed from monitored points (analog/digital points), constants, or other calculated points.
1. Employ arithmetic, algebraic, Boolean, and special function operations.
2. Treat calculated values like any other analog value, use for any function that a "hard wired point" might be used.

G. Event Initiated Programming: Event may be initiated by any data point, causing series of controls in a sequence.
1. Define time interval between each control action between 0 to 3600 seconds.
2. Output may be analog value.
3. Provide for "skip" logic.
4. Verify completion of one action before proceeding to next. If not verified, program shall be able to skip to next action.

H. Direct Digital Control: Each control unit shall provide Direct Digital Control software so that the operator may customize control strategies and sequences of operation by defining the appropriate control loop algorithms and choosing the optimum loop parameters.
1. Control loops: Defined using "modules" that are analogous to standard control devices.
2. Output: Paired or individual digital outputs for pulse-width modulation, and analog outputs, as required.
3. Firmware:
   a. PID with analog or pulse-width modulation output.

b. Floating control with pulse-width modulated outputs.
c. Two-position control.
d. Primary and secondary reset schedule selector.
e. Hi/Lo signal selector.
f. Single pole double throw relay.
g. Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities.

4. Direct Digital Control loops: Downloaded upon creation or on operator request. On sensor failure, program shall execute user defined failsafe output.
5. Display: Value or state of each of the lines which interconnect DDC modules.

I. Fine Tuning Direct Digital Control PID or floating loops:
1. Display information:
a. Control loop being tuned
b. Input (process) variable
c. Output (control) variable
d. Setpoint of loop
e. Proportional band
f. Integral (reset) Interval
g. Derivative (rate) Interval
2. Display format: Graphic, with automatic scaling; with input and output variable superimposed on graph of "time" vs "variable".

J. Trend logging:
1. Each control unit will store samples of control unit's data points.
2. Update file continuously at discretely assignable intervals.
3. Automatically initiate upload request and then store data on hard disk.
4. Time synchronize sampling at operator specified times and intervals with sample resolution of one minute.
5. Co-ordinate sampling with on/off state of specified point.
6. Display trend samples on work station in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time vs data.

2.07 HVAC CONTROL PROGRAMS

A. General:
1. Support Inch-pounds and SI (metric) units of measurement.
2. Identify each HVAC Control system.

B. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
4. Use outside air temperature to determine early shut down with ventilation override.
5. Operator commands:
a. Define term schedule
b. Add/delete fan status point.
c. Add/delete outside air temperature point.
d. Define heating/cooling parameters.
e. Lock/unlock program.
f. Request HVAC point summary.
g. Request HVAC saving profile summary.
6. Control Summary:

a. HVAC Control system begin/end status.
b. Heating/cooling mode status.
c. Start/Stop times.
d. Occupancy and vacancy times.

7. HVAC point summary:
   a. Control system identifier and status.
   b. Point ID and status.
   c. Outside air temperature point ID and status.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.
3. Operator commands:
   a. Add/delete fan status point.
   b. Lock/unlock program.
   c. Request HVAC point summary.
   d. Add/Delete discharge controller point.
   e. Define discharge controller parameters.
   f. Add/delete air flow rate.
   g. Define space load and load parameters.
   h. Request space load summary.
4. Control summary:
   a. HVAC control system status (begin/end).
   b. Supply air reset system status.
   c. Heating and cooling loop.
   d. High/low limits.
   e. Deadband.
   f. Response timer.
   g. Reset times.
5. Space load summary:
   a. HVAC system status.
   b. Heating/cooling loop status.
   c. Space load point ID.
   d. Current space load point value.
   e. Control heat/cool limited.
   f. Gain factor.
   g. Calculated reset values.
   h. Fan status point ID and status.
   i. Control discharge temperature point ID and status.
   j. Space load point ID and status.
   k. Air flow rate point ID and status.

D. Enthalpy Switchover:
1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.
2. Operator commands:
   a. Add/delete fan status point.
   b. Add/delete outside air temperature point.
   c. Add/delete discharge controller point.
   d. Define discharge controller parameters.

e. Add/delete return air temperature point.
f. Add/delete outside air dewpoint/humidity point.
g. Add/delete return air dewpoint/humidity point.
h. Add/delete damper switch.
i. Add/delete minimum outside air.
j. Add/delete atmospheric pressure.
k. Add/delete heating override switch.
l. Add/delete evaporative cooling switch.
m. Add/delete air flow rate.
n. Define enthalpy deadband.
o. Lock/unlock program.
p. Request control summary.
q. Request HVAC point summary.

3. Control summary:
   a. HVAC control system begin/end status.
   b. Enthalpy switchover optimal system status.
   c. Optimal return time system status.
   d. Current outside air enthalpy.
   e. Calculated mixed air enthalpy.
   f. Calculated cooling cool enthalpy using outside air.
   g. Calculated cooling cool enthalpy using mixed air.
   h. Calculated enthalpy difference.
   i. Enthalpy switchover deadband.
   j. Status of damper mode switch.

2.08 CHILLER CONTROL PROGRAMS

A. Chilled Water Reset: Automatically reset controlled chilled water temperature satisfying cooling coil requiring greatest cooling.

B. Chiller Sequencing: Determine which combination of chillers will most efficiently satisfy chilled water load, by cycling chillers, based on comparing load to switchover limits defined for each chiller.

2.09 PROGRAMMING APPLICATION FEATURES

A. Trend Point:
   1. Sample up to 30 points, real or computed, with each point capable of collecting 30 samples at intervals specified in minutes, hours, days, or month.
   2. Output trend logs as line graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique pattern, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

B. Alarm Messages:
   1. Allow definition of minimum of 25 messages, each having minimum length of 40 characters for each individual message.
   2. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totalized point's warning limit, hardware elements advisories.
   3. Output assigned alarm with "message requiring acknowledgement".
   4. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

C. Weekly Scheduling:
   1. Automatically initiate equipment or system commands, based on preselected time schedule for points specified.
   2. Provide program times for each day of week, per point, with one minute resolution.

3. Automatically generate alarm output for points not responding to command.
4. Provide for holidays, minimum of 366 consecutive holidays.
5. Operator commands:
    a. System logs and summaries.
    b. Start of stop point.
    c. Lock or unlock control or alarm input.
    d. Add, delete, or modify analog limits and differentials.
    e. Adjust point operation position.
    f. Change point operational mode.
    g. Open or close point.
    h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
    i. Begin or end point totalization.
    j. Modify totalization values and limits.
    k. Access or secure point.
    l. Begin or end HVAC or load control system.
    m. Modify load parameter.
    n. Modify demand limiting and duty cycle targets.
6. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.

D. Interlocking:
1. Permit events to occur, based on changing condition of one or more associated master points.
2. Binary contact, high/low limit of analog point or computed point shall be capable of being utilized as master. Same master may monitor or command multiple slaves.
3. Operator commands:
    a. Define single master/multiple master interlock process.
    b. Define logic interlock process.
    c. Lock/unlock program.
    d. Enable/disable interlock process.
    e. Execute terminate interlock process.
    f. Request interlock type summary.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 15940.

C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.

D. Provide conduit and electrical wiring in accordance with Section 16155. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct City of Bryan's representative in operation of systems plant and equipment for 1 day period.

C. Provide basic operator training for 3 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.

3.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to City of Bryan.

END OF SECTION

SECTION 15929

INSTRUMENTS AND CONTROL ELEMENTS

PART 1 GENERAL

1.01 Work Included

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Control System (BCS), utilizing Direct Digital Controls (DDC) as shown on the drawings and described herein. The BCS shall perform control algorithms, calculations and all monitoring functions. The BCS shall provide operator interaction and dynamic process manipulation, including overall system supervision, coordination and control. This shall include HVAC control, metering, energy management, alarm monitoring, and all trending, reporting and maintenance management functions related to normal building operations all as indicated on the drawings or elsewhere in this specification. The intent of this specification is to provide a control system which provides a seamless interface to the equipment. Where possible, the equipment manufacturer shall provide their controls as a factory-installed option on each piece of mechanical equipment provided. If this option is not available, a field-installed controller may be provided by the manufacturer of the mechanical equipment.

1.02 Related Work

A. Products furnished but not installed under this sections:
   1. Section 15183 –Hydronic Specialties:
      a. Control Valves
      b. Flow Switches
      c. Temperature Sensor Wells and Sockets
      d. Flowmeters
         1) Section 13851 –Fire Alarm System:
            (a) Duct Smoke Detectors with contacts for use by this contractor.
         2) Division 16 – Electrical:
            (a) Wiring and conduit required for dedicated 115 VAC outlets at the Operator Interfaces and accessories.
            (b) Wiring of power feeds through all disconnects, starters, and variable speed controllers to electric motors.
   2. Products installed but not furnished under this section:
      a. Application Specific or Product Integrated Controls (PIC) for Equipment by this supplier
         1) Interconnect PIC equipment to BCS bus
         2) Air Handling Equipment
         3) Thermostats
         4) System Description

1.03 General Requirements:

A. Provide and install a dedicated, stand-alone automatic Direct Digital Control system complete with all required software and hardware. This system will directly control all specified mechanical equipment, including air handlers, fans, pumps, central chiller plant machinery, etc.

B. The hardware shall consist of standalone DDC control panels, standalone application specific controllers (ASC's) and factory installed product integrated controls (PIC's) connected through an industry standard RS485 communications network.

C. The operator workstation shall run on a personal computer (PC) with a color monitor, mouse, keyboard, and printer. The operator workstation will allow a user to interface with the network via graphic and/or text format as described in the Product section Part2.

D. The controls contractor shall assume complete responsibility for the entire controls system as a

single source. He shall certify that he has on staff under his direct employ on a daily basis, factory trained technical personnel. These employees shall be qualified to project manage, engineer, commission, and service all portions of the control system as well as the mechanical system.

E. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate.

F. Basic System Features:
   1. Zone by zone direct digital logic control of space temperature, scheduling, optimum starting, equipment alarm reporting, and override timers for after-hours usage. A zone is the area served by one VAV box, heat pump, unit ventilator, fan coil, etc.
   2. Operator Interface software shall be Microsoft Windows 98, Windows 2000 or higher application. The software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Operation of the terminal software shall be simple and intuitive.
   3. Complete energy management firmware, including self-adjusting optimum start, power demand limiting, global control strategies and logging routines for use with total control systems. All energy management firmware shall be resident in field hardware and not dependent on the Operators Terminal for operation. Operators terminal software is to be used for access to field based energy management control firmware only.
   4. Priority password security systems to prevent unauthorized use. Each user shall have an individual password, or users can be assigned to a group password. Each user shall be assigned which control functions they have access to.
   5. Equipment monitoring and alarm function including information for diagnosing equipment problems and alarm dial out to remote sites or pagers.
   6. The complete system, including, but not limited to zone controllers, field installed controllers and operator's terminals shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in field installed controller memory shall be battery backed up for a minimum of 1 year. Batteries on unitary controllers shall not be allowed.
   7. Modular system design of proven reliability.
   8. Each field panel capable of independent control.
   9. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal.
   10. The system shall be capable of recording equipment runtime totalization of fans, heaters, boilers, etc., and also capable of alarm generation and alarm dial out to remote sites.
   11. Communication wiring for field controllers shall not be run in star patterns.
   12. All DDC hardware and software shall be designed and manufactured by U.S. corporations. All hardware shall be Listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the U.L. standard for safety 916, with integral labels showing rating.
   13. Quality Assurance

G. Responsibility:
   1. The supplier of the Building Control System shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by him.

H. Component Testing:
   1. Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. The manufacturer prior to shipment shall individually test each and every controller, sensor, and all other DDC components.

I. Tools, Testing and Calibration Equipment:

1. The Building Control System supplier shall provide all tools, testing and calibration equipment necessary to ensure reliability and accuracy of the control system.

1.04 Installer Qualification:

A. The installer shall have an established working relationship with the Building Controls Systems Manufacturer for not less than three years.

B. The installer shall have completed the Building Control Systems Manufacturer's classes on the control system. The installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.

C. The installer shall have a minimum of five years documented experience in Building Control Systems installations and be approved by the Manufacture or their authorized Distributors.

1.05 Product Qualification:

A. All products used in this installation shall be new, currently under manufacture, and shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract.

1.06 Reference Standards

A. The latest edition of the following standards and codes in effect and amended as of date of supplier's purchase order, and any subsections thereof as applicable, shall govern design and selection of equipment and material supplied:
   1. ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standards 90.1 and 62.99
   2. (Directive 89/336/EEC (European CE Mark).
   3. City, county, state, and federal regulations and codes in effect as of date of purchase order.
   4. Except as otherwise indicated, the system supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.
   5. Submittals

1.07 Drawings:

A. The system supplier shall submit engineered drawings, control sequences, bill of materials, bus riser diagrams, hardware/software product data sheets, and applicable valve and damper schedules for approval.
   1. Drawings shall be submitted in the following standard sizes: 11" x 17" or 8 ½" x 11"
   2. Six complete sets of submittal drawings shall be provided.
   3. Drawings shall be available on CD-ROM.

B. Operation and Maintenance Manuals:
   1. Manuals will be provided prior to final acceptance and shall include:
   2. Installation instructions.
   3. Principles of operation and a detailed system description.
   4. Startup and operating instructions.
   5. System layout and interconnection schematic diagrams.
   6. Routine preventive maintenance procedures and corrective diagnostic troubleshooting procedures.
   7. Name, address and telephone number of the DDC Systems field representative.
   8. Complete recommended spare parts list.
   9. Scheduling And Coordination

C. The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software configuration phases.
   1. The schedule shall show all the target dates for transmission of project information and

documents and shall indicate timing and dates for system installation, debugging, and commissioning.

D. Warranty
   1. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion and acceptance by the owner, except for damages from other causes.
   2. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours during normal business hours.
   3. This warranty shall apply equally to both hardware and software and be at no cost to the owner.

E. Manufacture
   1. The installer shall only use products from the following list of acceptable manufacturers:
      a. Carrier Corp.
      b. Trane
      c. York
   2. Other manufacturers may be accepted if submitted description meets all requirements as outlined in paragraph C. of this section.
   3. Alternative bidders will be accepted if prior to bid time they submit a complete proposal, including submittal sheets, and drawings of the proposed system. Drawings shall be specific to proposed project and include all information necessary to install the system. Alternative bidders shall also submit a compliance statement (referencing the project specifications) stating paragraph by paragraph that their system meets or does not meet requirements of each paragraph. If the proposed system does not meet requirements of a specific paragraph, bidder's proposal shall explain for each such paragraph how proposed system does not meet those requirements.
   4. Owner reserves the right to reject, at his option, any and all bids that do not meet the specified requirements stated.

PART 2 PRODUCTS

2.01 Hardware

A. Energy Management PC

B. Single User PC
   1. Description
      a. Operators shall interface to the EMS with a computer as shown on the plans or indicated elsewhere. The computer shall be stand-alone and connected to a single CCN.
      b. The CCN shall be physically connected to a computer’s communication port through a RS-232 to RS-485 conversion interface device. This interface device may be provided internally as part of the computer, or it may be added externally to one of the computer’s communication ports.

C. PC Station:
   1. The EMS computer shown on the plans or indicated elsewhere, shall include the following as a minimum:

D. Personal Computer – 586/233 MHz or higher Intel®-based processor with 256 cache RAM
   1. 512 MB of RAM
   2. 80 GB hard drive
   3. 17" 800 x 600 super VGA non-interlaced color monitor
   4. 800 x 600 video graphics adapter card with 4 MB video RAM

5. CD ROM
6. Internal Modem card
7. One parallel, serial, and one mouse port with all cables for system operation
8. Mouse and keypad
9. Multi-tasking software e.g., Windows 2000 Professional, or Windows XP Professional
10. Report & Alarm Printer (See plans for exact requirements)
11. Operating Software:
12. Multi-tasking, single user operating software shall be provided for the operator's station, as shown in the contract documents. The vendor shall provide all required software, including the database. The PC shall be capable of running Windows XP Professional operating system. All new PCs shall include Windows XP operating software.

E. Field Installed Controller (FIC)
1. Chiller Plant
   a. Description
   b. The factory-furnished, programmed, microprocessor-based controller shall be provided to supervise and optimize the operation of the individual Product Integrated Controllers (PIC) for each chiller. All application software actually performing the required control functions shall be factory-supplied with the controller and shall be pre-tested and pre-configured.
   c. The networked chiller factory-installed Product Integrated Controllers (PICs) shall interface with the equipment manufacturer's Central Plant Controller (CPC) installed on the network. The CPC shall include software that allows dynamic interaction between the CPC and the chiller PIC(s) to create a complete chilled water plant system as described within this specification.
   d. The CPC shall include inherent input and output capability. The input/output capability shall include as a minimum a combination of standard HVAC sensor inputs (5k, 10k, 4-20mA and discrete) an output to drive an alarm annunciator and/or alarm light, and two analog outputs for differential pressure control. Each analog input channel shall include an operator-adjustable sensor trim (adjustable to 1/10°F) and programmable low and high alarm/alerts, as applicable.
   e. The CPC shall not interfere with the PIC's stand-alone operating or safety algorithms but shall enhance the operation by providing the following inherent capabilities as a minimum:
2. Control of the two chillers.
   a. Enable/disable the chiller plant based on its internal time schedules, remote contact closure, analog temperature override, network command, or time schedule override.
   b. Chiller fault logic and automatic starting of lag chiller(s).
   c. Algorithms that properly match the chillers with the load.
   d. Chiller inhibit timers.
   e. Bypass valve control.
   f. kW balancing and ramp loading.
   g. Demand limiting.
   h. Chilled water reset.
   i. Power fail restart.
3. The CPC shall contain factory-programmed software for the following types of mechanical systems:
   a. Control of chillers with dedicated chilled water pumps and no secondary piping.
   b. Control of chillers with chilled water pumps in parallel arrangement and no secondary piping.
   c. Control of chillers piped in series with a single chilled water pump and no secondary piping.
   d. Control of chillers with dedicated primary (production loop) pumps and secondary (distribution

1) loop) pumps piped in a parallel arrangement.

e. Control of parallel chillers, common primary pumps, constant flow (common constant speed
   1) secondary pumps), variable flow (two-way valves) with a differential pressure valve and line.

f. Control of parallel chillers, common primary pumps, variable flow (two-way valves), with a
   1) differential pressure valve and bypass line.
   2) CPC Attributes

4. The controller shall be powered from standard, off-the-shelf, Class II, 24-volt transformers. The controller shall be listed under UL916 PAZX (Energy Management), UL 864 UDTZ (General Utility Signaling), VDE, and CSA. Products shall be manufactured in a facility having a Quality System that is registered to either ISO 9002 or ISO 9001 Quality Assurance Standard. The controller shall be designed to be easily mounted in a standard NEMA 1 type enclosure without special rails or mounting hardware and as local and national code dictates.
5. The controller shall include a 365-day real time clock and watchdog timer diagnostic indicator provided by an LED. The watchdog timer shall reset upon power on and be resetable by software thereafter. Should the watchdog timer not be resetable during the timing period, it shall time out and set all outputs to their non-powered state. The LED shall illuminate solidly to indicate this failure.
6. The controller shall not require a battery. All configuration data will be stored in nonvolatile memory. The controller shall provide a minimum of two days data retention for the time clock. Systems that require a battery to store data are not acceptable.
7. The controller shall include the capability to provide a local interface for all operating values, alarms, etc., via a panel mounted, Local Interface Device. The controller shall also be capable of interfacing to a portable PC for configuring or altering the configuration, setting the address, performing uploads/downloads, etc., through a separate, additional RJ14 plug.
8. The CPC shall monitor the status of each chiller's present local/auto selector position, through network communications. Whenever the position is indexed to local, the PIC shall perform its stand-alone control functions. When the PIC is indexed to the local mode the CPC shall determine that the chiller is not available for chiller plant control and shall be bypassed by the CPC. When the mode is indexed to the remote position the chiller PIC shall have the following programs superseded by the CPC:
   a. Lead/lag
   b. Chilled water reset
   c. Remote contact start
   d. Demand limiting.
9. Communication Wire
   a. Wiring and Raceways - Communications Bus (When Part of a Network)
   b. Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16. All insulated wire to be stranded copper conductors and UL labeled for 90C minimum service.
10. The CCN communications bus shall convey commands, data, and alarms between system elements (controllers) themselves and between controllers and an optional operator workstation. The Communications Bus shall be a three-conductor cable with shield. EIA Standard RS-485 Communication's protocol shall be employed. The communications bus shall comply with FCC Part 15, Subpart J, Class A for bus radiated and conductive noise.
11. Physically, bus extender devices (Repeaters) may be utilized to extend the CCN primary bus in length and number of networked controllers. Each Repeater shall be able to regenerate and transmit bi-directional signals and support communications for the added bus segment. The repeater shall be equipped with LED lights to indicate communications through its RS-485 port.

12. The CCN primary communications bus may also be extended by the use of multiple-Bridge devices to create a network of multiple secondary busses. Each secondary bus shall be isolated from the primary bus. Like the primary bus, each secondary bus may utilize bus extender modules (Repeaters) to extend the bus in length and increase the number of networked controllers. The Bridge shall allow its secondary bus to operate at different communication speed than the primary bus. Bridges may not be placed on a secondary bus to create a third level bus. The Bridge shall be equipped with LED lights to indicate communications through its RS-485 ports.
    a. Each Bridge shall also contain software that creates and maintains a directory of all controllers located on its secondary bus. The directory shall contain the name and network address of each controller on the bridge's secondary bus. The Bridge software shall also regularly perform diagnostic checks to determine if the secondary bus's controllers are functioning correctly. When a diagnostic check indicates that a malfunction exists in a secondary bus controller, the bridge shall send an error message on to the primary bus to an alarm acknowledger.
13. Whenever the Communications Bus enters or leaves a building, the Bus shall be provided with adequate lightning suppression devices.
14. The Communications Bus shall be capable of communicating through a telephone modem to a remote building. This interface shall allow any EMS operator’s workstation, as applicable, to communicate with any other remotely located, compatible, communications.

F. Field Sensors
1. Common Field Sensors
2. Space Temperature Sensors
    a. Space Temperature Sensors shall be 5,000 or 10,000-ohm thermistors or resistance temperature detector types with wall plate adapter and blank cover assembly. If so indicated on the plans, the sensor shall include an integral occupancy override button, an RJ11 communications port, and optional space temperature adjustment slide.
3. Communicating Space Temperature Sensors
    a. Communicating Space Temperature Sensors shall be powered by 24 Vac, wall mounted, and control the room's HVAV (heating, cooling, and ventilation) equipment through RS-485 bus communications. The sensing element shall be a 10,000-ohm thermistor and enclosed in a plastic housing. Sensors shall be equipped with a liquid crystal display (LCD) with 4 push-button user interface for configuring setpoints and time schedules. Sensors shall store configuration parameters in non-volatile memory and provide coordinated control of the HVAV equipment after a power outage.
4. Outside Air Sensors
    a. Outside Air Sensor shall be 5,000 or 10,000-ohm thermistor, with integral PVC housing and ½” NPT conduit connector.
5. Water Temperature Sensors
    a. Water Temperature Sensors shall be well mounted or pipe-clamp types as specified on the plans. Sensors shall be 5.000 or 10,000-ohm thermistors, or 1,000-ohm RTDs. Locate as shown on the plans, and provide extended neck wells where applicable on insulated pipes.
    b. Changeover thermostats shall be 10,000-ohm strap on thermistors with flexible copper plate and screw clamp for externally mounting on the pipe.
6. Space and Duct Relative Humidity Sensors
    a. Space Relative Humidity Sensors shall and have a range of 0-100% RH. The measuring accuracy shall be between 2% and 5% as indicated on the plans over the range of the device.
7. Outdoor Air Relative Humidity Sensors
    a. Outdoor Relative Humidity Transmitters shall be enclosed in a weather-tight junction box and measure outdoor air humidity from 0% to 100% with accuracy between 2% and 5% as needed to fit the application. Transmitters shall not require calibration and

shall provide a 2-wire 4-20 mA, 3 wire 0-5 Vdc, or 3 wire 0-10Vdc output signal.

8. Space CO2 Sensor with Temperature Sensors
    a. The wall mounted combination sensors shall contain a space temperature sensor and Carbon Dioxide (CO2) sensor in a single unit. TheCO2 sensor shall use single-beam absorption infrared diffusion technology and be self-calibrating. The CO2 range shall be 0-2000 PPM with analog outputs of 4-20 ma or 0-10 v. with a power source of 18-30 Vac, 50/60 Hz. The accuracy shall be +/- 100 PPM at 60F to 90F. The sensor shall include an integral occupancy override button, a set point adjustment slide bar, and an RJ14 communication port.
9. Space and Duct CO2 Sensors
    a. The wall mounted, hand held, or duct mounted sensors shall utilize single-beam absorption infrared diffusion technology, and be self-calibrating. The CO2 range shall be 0-2000 PPM with analog outputs of 4-20 ma or 0-10 v. with a power source of 18-30 Vac, 50/60 Hz. The accuracy shall be +/- 100 PPM at 60F to 90F.
10. Transmitters
    a. Pressure Transmitters
        1) Transmitters shall provide accessible zero and span adjustments, and shall measure gauge or differential pressure of liquids or gases over several operating scales extending from 30 inches vacuum to 2000-psig. The Transmitter shall vary the output current in proportion to the input pressure, and shall operate with a nominal supply voltage of 12 to 32 V dc as needed and provide a 4-20 mA output signal.
    b. Flow Transmitters
        1) Transmitters shall be powered by 24 Vdc, and provide a digital display of gpm and totalized flow. Transmitters shall convert a digital flow signal into a 4-20 mA output signal for flow rate indication, and divide the digital input signal into a selectable digital dry or electronic contact pulse output signal for flow totalization indication. Transmitters shall provide excitation voltage for flow sensors and an LED indication of pulse activity.
11. Current to Pressure Transducers
    a. Current to Pressure Transducers shall convert the 4 to 20ma or 0 to 10 Vdc analog output signal from the controller into a 3-15 PSI pneumatic output. It shall contain a 0-30 PSI manifold gauge indicating actual output air pressure.
12. Flow Sensors
    a. Flow Sensors shall utilize differential pressure or a vane to measure water flow and have an operating range with an adjustable setpoint as needed. Water flow types shall be complete with safety shut-off valves and all necessary connections. Flow sensors shall generate a 4-20ma or 0-10Vdc proportional signal as needed.
13. Status Indication
    a. A current sensing or differential pressure device shall provide status indication for fans and pumps.
    b. The current sensing device shall be installed at the motor starter or motor to provide load indication. The device shall consist of a current transformer, a solid state current sensing circuit with adjustable trip point, and a solid state or contact switch. A red light emitting diode (LED) shall indicate the ON OFF status of the unit. The switch shall provide a N.O. contact for wiring back to the General Purpose Controller.
    c. A differential pressure sensing device shall be installed across the fan or pump and utilize two sensing elements to provide pressure indication. The device shall operate a SPDT switch with adjustable trip point contact for wiring back to the General Purpose Controller.
14. Float Switches
    a. Float Switches shall be equipped with a stainless steel float, magnetically actuated, and capable of sensing fluids with a specific gravity of 0.7 and higher.
15. High Temperature Detection Thermostats

a. High Temperature Detection Thermostats shall be of the manual reset type with sensing element arranged to insert into duct or casing and shall be set for 165F. The device shall have double pole, NO, NC contacts for supply fan shutdown and remote alarming.

16. Low Temperature Detection Thermostats
    a. Low Temperature Detection Thermostats shall be of the manual reset, type unless otherwise specified, with sensing element not less than 20 feet long. The device shall have double pole, NO, NC contacts for supply fan shutdown and remote alarming. If alarming is not required, the device shall have a single pole, NC contact.
17. Duct High Pressure Cutout Switches
    a. Duct High Cutout Pressure Switches shall include a manual reset single pole double throw pressure switch with a setpoint range of 1.4 to 5.5 inch water column, tubing and tubing adapters.
18. Start/Stop and Status Relays
    a. Start/Stop and Status Relays shall be designed to plug into a screw terminal-mounting socket. Relays shall be single pole, or double pole as required with double throw contacts rated for required duty. Magnetic Latching Type Control Relay coils shall be activated by a pulsed input and shall maintain condition even during a power failure. A built-in indicator shall show set/reset condition.
19. Power Supplies and Transformers
    a. Power Supplies and Voltage Transformers shall convert 120 Vac primary supply voltage into 24 Vac or 24 Vdc control voltage as needed.
20. Controlled Devices
    a. Dampers / Valves / Actuators
21. Motorized Control Dampers
    a. Unless specified elsewhere, shall be as follows:
        1) Multiple blade dampers shall be parallel or opposed blade type as listed below or as scheduled on the drawings.
        2) Single blade round dampers shall have an elliptical blade.
        3) Modulating outdoor air and exhaust dampers shall be opposed blade type with blade and side seals.
        4) Modulating return air dampers shall be parallel blade type with blade and side seals.
        5) Two position shut off dampers may be parallel or opposed blade type with blade and side seals.
        6) Damper frames shall be 16 gauge galvanized steel channel or 1/8” extruded aluminum with reinforced corner bracing.
        7) Damper blades shall not exceed 8” in width or 48” in length. Blades are to be suitable for medium velocity performance (<2000 fpm). Blades shall not be less than 16guage.
        8) Damper shaft bearings shall be as recommended by manufacturer for the application, Oilite or better.
        9) All blade edges and top and bottom of the frames shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 10 cfm/sq. ft at 4” w.c. differential pressure.
    b. Individual damper sections shall not be larger than 48” wide x 60” high. Provide a minimum of one damper actuator per section.
    c. Dampers shall have exposed linkages.
22. Electronic Valve and Damper Actuators
    a. Unless specified elsewhere, shall be as follows:
        1) Electronic actuators, less than 600 in-lb. of rated torque, shall have ISO Electronic 9001 quality certification and be UL listed under standard 873, CSA C22.2 No. 24 and have CE certification.

2) Electronic actuators used on valves or dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.
3) Actuators shall be fully modulating/proportional, pulse width, floating/tri-state, or two-position as required and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices if required.
4) Optional auxiliary switches shall be available.
5) Actuators shall have an operating range of –22° to 122°F.
6) Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a load resistor) operating range.
7) Actuators shall be capable of operating on 24, 120 or 230VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 50 VA for AC, including 120VAC actuators.
8) Actuators shall have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation.
9) For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models > 60 in-lbs. will be capable of mounting on shafts up to 1.05” in diameter. Spring return actuators with more than 60 in-lb. of torque shall have a metal, manual override crank.
10) Upon loss of control signal, a proportional actuator shall fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator shall maintain the last position.
11) Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Valves and dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators.
12) Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf," standard actuators ready for field wiring.
13) Damper and valve actuators will not produce more than 62 dB when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB(A) with power on or in the running or driving mode.

23. Direct Coupled Globe Valve Actuator and Adapter Bracket
    a. Actuator shall be designed with an integrated adapter bracket that will direct mount to the valve.
    b. Actuator shall provide a linear force capable of fulfilling the required close-off of the valve.
    c. Actuator shall include an automatic valve-coupling device that shall lock securely to the valve stem.
    d. Proportional and spring return actuators shall adapt upon powering the actuator. This adaptation will determine stroke length and enable the actuator to set the minimum and maximum limits of the supplied control signal, thereby utilizing the entire control signal range. Feedback, running time and other parameters are automatically adjusted to the effective stroke.
    e. Actuator shall have a manual override equipped with an inter-locking device to protect the actuator from over-torque of the manual override.
24. Industrial Type Actuators For Butterfly Valves
    a. The valve actuator shall consist of a capacitor-type reversible electric motor, gear

train, limit switches and terminal block, all contained in a die cast aluminum enclosure.

b. Enclosure shall be designed to meet NEMA 4 (weatherproof) requirements, or CSA approved for non-hazardous or hazardous locations.
c. Output shaft shall be electrolysis nickel plated to prevent corrosion.
d. The enclosure will have an industrial quality coating.
e. Actuator shall have a motor rated for continuous duty.
f. The motor shall be fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1 pH, 60 Hz supply. A self-resetting thermal switch shall be imbedded in the motor for overload protection.
g. A 6 ft wiring harness shall be provided for ease in field wiring (Above 1500 in-lbs).
h. Actuator will have a suitable sized NPT entry for external connections.
i. Reduction gearing shall be designed to withstand the actual motor stall torque.
j. Gears shall be hardened alloy steel, permanently lubricated. A self-locking gear assembly or a brake shall be supplied.
k. Two adjustable cam actuated end travel limit switches shall be provided to control direction of travel.
l. 2 SPDT auxiliary switches, rated at 250 VAC shall be included.
m. Actuator shall be equipped with a hand wheel or shaft for manual override to permit operation of the valve in the event of electrical power failure or system malfunction. Hand wheel, where applicable, must be permanently attached to the actuator.
n. When in manual operation electrical power to the actuator will be permanently interrupted.
o. The hand wheel will not rotate while the actuator is electrically driven.
p. Actuator shall have heater and thermostat to minimize condensation within the actuator housing.
q. Modulating units shall include programmable card capable of 0-10 VDC, 2-10 VDC, 4-20mA, and 1-5 VDC default settings.

25. Electronic Control Valves
    a. Unless specified elsewhere, shall be as follows.
        1) General
            (a) The manufacturer shall be capable of providing individual valve identification tagging on each printed valve label. Valve tag identification shall be documented on the approved, submitted valve schedule.
            (b) Valve actuator(s) shall provide the minimum torque, based on the manufacturers' calculations, required for the rated valve close off.
26. Zone Valves
    a. Zone valves shall be as specified.
    b. Zone valves with brass bodies shall be used in terminal unit water applications where sizing or physical limitations prohibit the use of characterized control valves, or in terminal equipment, where water sizing dictates a 2 or 3-way electronic control valve 3/4" or smaller.
    c. The valve manufacturer shall provide the contractor a choice of threaded union male NPT, compression ends or copper sweat ends for each valve.
    d. Zone valve actuators shall have a minimum of 30 psi close-off rating.
27. Control Valves
    a. Control valves shall be of the Characterized Control™ Valve type.
    b. Characterized Control™ Valves shall be used for all water applications where sizing permits.
    c. A Tefzel, flow-characterizing disc shall be installed in the inlet of 2-way characterized control valves and in the control port of 3-way valves. The valve trim shall utilize a stainless steel ball and stem for all water or glycol solutions up to 50%. For water applications, an optional chrome plated brass ball and brass stem can be used.
    d. Valve bodies shall be nickel-plated, forged brass with female NPT threads. Bodies to 1-1/4" shall be rated at 600 psi and sizes 1-1/2" to 2" at 400 psi. The maximum

allowable pressure differential shall be 150 psi for on/off and 50 psi for modulating service.

e. Characterized Control™ Valves shall have a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglass reinforced Teflon seats shall be used.

f. The valves shall have a four bolt mounting flange to provide a 4 position, field changeable, electronic actuator mounting arrangement.

g. A non-metallic coupling, constructed of high temperature, continual use material shall provide a direct, mechanical connection between the valve body and actuator. The coupling shall be designed to provide thermal isolation and eliminate lateral and rotational stem forces. Vent hole shall be provided to reduce condensation build-up.

28. Globe valves

a. 2-way and 3-way globe valves may be used only if characterized control valves do not fit the sizing criteria or application.

b. Globe valves may be used for chilled or hot water, steam, or glycol solutions to 50%. Screwed and flanged water valves shall have equal percentage or linear flow characteristics for 2 or 3-way valves, respectively. All stems shall be stainless steel.

c. Screwed globe valves 1/2” through 2” shall have bronze bodies rated at ANSI Class 250. For water or steam up to 35 psi, trim shall include a brass plug, a spring-loaded TFE packing, and a bronze seat. The maximum differential shall be 35 psi for water and 20 psi for steam.

d. 2-way and 3-way flanged globe valves 2-1/2” to 6” shall have cast iron bodies rated for ANSI Class 125. The maximum differential shall be 25 psi for water and 10 psi for steam. Trim shall include stainless steel stems, bronze plugs, bronze seats, and a TFE V-ring packing.

e. For steam inlet pressures higher than those stated above, furnish globe valves with stainless steel trim specifically rated for the application.

29. Butterfly Valves

a. Butterfly valves 2 to 12” shall have a fully lugged, drilled and tapped, cast iron body. Flanges shall meet ANSI 125/150 standards. The one-piece body shall feature an extended neck allowing sufficient clearance for flanges and 2” of piping insulation. The disc shall be aluminum bronze and provide bi-directional bubble-tight close off in either direction for water or 50% glycol applications. The disc shall be polished and contoured to minimize torque and wear. The flow characteristic shall be modified equal percentage for 2-way valves and linear for 3-way valves. The 2” - 6” valves shall be rated for a maximum of 200 psi close-off and 8” - 12” shall be rated a maximum of 75 psi close-off.

b. The disc shall have full 360-degree concentric seating. A 316 stainless steel taper pin shall provide a positive connection of the disc to a one piece, 416 stainless steel shaft. A phenolic backed, non-collapsing, EPDM seat shall be field replaceable and shall create a positive seal between flange face and valve body. No gaskets shall be required between the valve and flange faces. The shaft shall be supported at three locations by PTFE bushings.

c. Butterfly valves may be used in all two-position applications, in modulating applications larger than 2-1/2”, or where the close off rating of other valve styles does not meet the design requirements.

d. A CV Factor of (60) degrees shall be used for sizing all modulating butterfly valves.

e. High torque industrial valve actuators, >600 in-lb. of rated torque, may be used where low torque actuators are not suitable.

f. High torque electronic industrial actuator enclosures shall be designed to meet NEMA 4 (weatherproof) requirements, or have CSA approval for non-hazardous or hazardous locations. An NPT entry for external connections shall be provided.

30. Application Specific Controllers

a. Demand Controlled Ventilation

b. Ventilation Sensors: Wall-Mounted Combination Sensors
   1) Wall-mounted combination sensors shall contain a space temperature sensor and Carbon Dioxide (CO_2) sensors in a single, decorative housing. The CO_2 sensor shall use single-beam absorption infrared diffusion technology (non-dispersive infrared), and shall have integral programming to perform automatic baseline calibration without user interface. The recommended manual recalibration period shall not be less than five years. Other sensors features shall include:
   2) Operating conditions: 60 to 90ºF (15 to 32ºC), and 0 to 95% RH, non-condensing.
   3) CO_2 sampling method: diffusion.
   4) CO_2 sensor output: 4 to 20 ma or 0 to 10-Volt signal.
   5) CO_2 measurement range: 0-2,000 PPM.
c. Sensitivity: ±20 PPM.
d. Accuracy: ±100 PPM at 60 to 90ºF (15 to 32ºC); and 760 mmHg.
e. CO_2 sensor calibration: single point calibration via push button and LED.
f. Combination sensors shall be provided with the manufacturer's recommended Carbon Dioxide calibration kit. The quantity shall be suitable to initially calibrate each project sensor.
g. Ventilation Sensors: Wall-Mounted Carbon Dioxide Sensors
h. Carbon dioxide (CO_2) sensors shall be manufactured in a decorative, wall-mounted housing. The CO_2 sensor shall use single- or dual-beam absorption infrared diffusion technology (non-dispersive infrared), and shall have integral programming to perform automatic baseline calibration without user interface. The recommended manual recalibration period shall not be less than five years. Sensors shall be equipped with an LED display. Other features of wall-mounted Carbon Dioxide sensors shall include:
   1) Operating conditions: 60 to 90ºF (15 to 32ºC), and 0 to 95% RH, non-condensing
   2) CO_2 sampling method: diffusion or flow-through.
   3) CO_2 sensor output: 4 to 20 ma or 0 to 10-volt signal.
   4) CO_2 measurement range: 0–10,000 PPM.
   5) Setpoint: adjustable.
   6) Sensitivity: ±10 PPM.
   7) Accuracy: ±50 PPM (0-2000 PPM), ±5% of reading (2000–10,000 PPM).
i. CO_2 sensor calibration: single point calibration via push button and LED
j. Relay contacts: normally open or normally closed, 2 amps at 24 vac.
k. Carbon Dioxide sensors shall be provided with the manufacturer's recommended calibration kit. The quantity shall be suitable to initially calibrate each sensor provided for the project.

31. Ventilation Sensors: Duct-Mounted Carbon Dioxide Sensors
    a. Carbon Dioxide (CO_2) sensors for duct-mounted applications shall be identical to the wall-mounted sensors specified above except as described below.
    b. The CO_2 sensor shall be mounted in an enclosed aspirator box that mounts directly to the duct. The aspirator box shall be equipped with an induction tube to direct a side-stream of air from the duct through the CO_2 sensor. A hinged, clear access door shall be installed on the front of the aspirator box to permit access to the sensor and to permit viewing the sensor without opening the door.
    c. CO_2 sensors for duct-mounted applications shall be designed for flow-through sampling.
32. Zone Controllers
    a. The following paragraphs describing DCV requirements for solid-state, microprocessor (direct digital) controllers, and should be inserted as supplements to the project controller specifications. They are not intended to describe the complete requirements for controllers.
    b. Zone controllers shall be capable of being added to a system network without additional hardware. They shall be designed for connection to other zone controllers

and to a common system controller to perform DCV control functions as part of an integral ventilation system.

c. Zone controllers shall be designed to interface directly with the specified CO2 sensors.

d. Zone controllers shall be capable of maintaining a ventilation setpoint through a DCV algorithm in conjunction with system controller to fulfill the requirements of ASHRAE standard, 62-1989 “Ventilation For Acceptable Indoor Air Quality” (including Addendum 62a-1990). The algorithm shall also be capable of modulating the terminal unit heating to maintain the space temperature between the heating and cooling setpoints. For terminal units without supplementary heating, the zone controller DCV algorithm shall have a primary airflow limit to protect the zone from overcooling.

33. System Controllers:

a. System controllers shall be specifically designed to provide demand-controlled ventilation (DCV) operation using a proportional-integral (PI) control loop. All DCV application software shall be resident in the system controller’s memory and shall be factory-tested and factory-configured. The system controller shall be capable of stand-alone operation and shall execute the DCV control functions with out being dependent on a network system, additional hardware, or intermediate controllers.

b. The system controller shall be designed for connection to zone controllers to perform DCV control functions as part of an integral ventilation system.

c. The system controller shall be designed to interface directly with the specified CO2 sensors.

d. The system controller shall be capable of maintaining a ventilation setpoint through a DCV algorithm in conjunction with zone controllers to fulfill the requirements of ASHRAE standard, 62-1989 “Ventilation For Acceptable Indoor Air Quality” (including Addendum 62a-1990).

34. Unit (Product Integrated) Controllers

a. The unit controller shall be a solid-state microprocessor controller using direct digital control and software specifically designed to provide demand controlled ventilation (DCV) functions. The controller shall be factory-installed and wired within the unit, and shall be furnished complete with all application software to perform DCV functions. The unit controller shall be pre-configured and pre-tested for DCV operation.

b. The controller shall maintain an adjustable CO2 setpoint by control of the mixed-air damper position. The unit controller shall also have the ability to limit the maximum amount of outdoor air during DCV operation, and modulate heating to maintain a minimum supply air temperature.

c. The unit controller shall be designed to interface directly with the specified CO2 sensors.

35. Product Integrated Control (PIC) Factory Mounted Controls

a. VAV Terminal

b. VAV Air Terminals w/ Factory Communicating Controls Description:

c. Microprocessor controlled, EMS communicating, Air Terminal. Air Terminal communicates with and sends alarm’s to, the building automation network and alarm printer, utilizing a factory installed microprocessor.

d. Each Air Terminal shown on the plans shall include a factory mounted and wired Air Terminal Controller (ATC). Each ATC shall include a microprocessor-based controller and shall be an integral part of the equipment. The ATC shall control each function of its associated terminal. All application software shall be resident in the ATC's memory and shall be factory pre-tested and preconfigured.

e. The ATC shall provide stand-alone operation but shall include the inherent capability of being added on a network without the addition of any hardware. Systems that require an intermediate controller shall not be acceptable. The ATC shall not require a battery. All configuration data shall be stored indefinitely in non-volatile memory. Systems that require a battery to store data are not acceptable.

f. The ATC shall be mounted in a standard NEMA type enclosure, attached to the unit

as required by local and national electrical codes. The control, shall be UL or ETL listed to comply with UL Standard 1995 Heating and Cooling Equipment. All electrical components and control transformers shall be factory mounted and wired inside the control box, or the electric heater, as applicable.

g. Each ATC shall include the ability to maintain a 365-day clock with holiday functions and shall also support network broadcasts of time for clock synchronization. Each ATC shall provide the capability to provide occupancy scheduling from its own local time schedule, or a time schedule within another controller on the network. Timed override requests through the space temperature sensor override button shall be performed by each ATC without any network requirement. The ATC shall be capable of interfacing to a portable PC for configuring, altering the configuration or airflow setpoints, setting address, uploads, downloads, etc.

h. All terminals that are serviced by a common air handler shall be “LINKED” together to form a single virtual load and operate in unison as a complete system. One ATC shall be designated as a coordinator between the Air Handler Controller and its associated terminals. The networked ATC(s), through the coordinator, shall interface with a controller installed on the primary air source. The primary air system interface shall be a factory supplied microprocessor based controller that allows total closed loop system control. The Building Control System communications network and factory provided software shall allow dynamic interaction (linkage) of the air terminals with the primary air source to create a complete Air Distribution System (ADS) as later described within this specification. The bus that serves the ATC(s) and air source shall include the ability to run at 38AK BPS, as a minimum.

i. Alarm/Alert Processing — The ATC shall contain routine(s) to process alarms and alerts. Alarm/alert processing shall consist of a scan of all applicable point types and operating conditions. Certain analog alarms/alerts shall only be monitored when the ATC is in the occupied mode (i.e., relative humidity, indoor air quality sensor). Time delays shall be provided with the software to prevent nuisance alarms/ alerts during a transition period or if a setpoint change occurs. All alarms/alerts shall be displayed at a portable PC and via the network to a remote EMS operator's station or alarm printer as applicable.

j. The ADS system shall contain a routine to process alarms. Alarm processing shall consist of a scan of all input points. The ATC shall be shipped with factory entered default alarm thresholds. Alarm processing logic shall also monitor return to normal conditions as part of the alarm scan routine.

36. Terminal Control Types:
    a. Terminal controls shall be factory mounted and wired for the following types of VAV Pressure Independent terminals, as applicable:
    b. VAV Single Duct Terminals:
        1) Cooling only
    c. VAV Series Fan Powered Terminal:
        1) Cooling with constant volume fan, induced air heat
        2) Cooling with constant volume fan, induced air, and modulated hot water heat.
        3) Terminal Control Components:
    d. As a minimum, the ATC shall be supplied with the following standard control hardware for each terminal, as applicable:
37. Air Flow Pick-up and Transducer:
    a. Each ATC shall include a factory supplied, mounted and piped multi-point airflow pick-up. The pick-up shall provide a differential pressure signal to an on-board airflow transducer assembly. The airflow transducer shall automatically zero calibrate itself and shall be designed to read a flow signal of 0.0 to 2.0 inches of water.
38. Leaving Air Temperature Sensor:
    a. The leaving air temperature sensor shall be factory provided and wired on all ATC’s that include factory supplied heat, if shown on the I/0 list — or if mentioned in the

Sequence of Operation. The leaving air terminal sensor shall consist of a thermistor in a stainless steel probe, with a nominal resistance of 10000 ohms at 77°F (RTD's shall also be acceptable).

39. Space Temperature Sensor:
    a. The space temperature sensor shall be field supplied for field installation as shown on the plans. The sensor shall consist of a thermistor with a nominal resistance of 10000 ohms at 77°F (RTD's shall also be acceptable), termination block with screw terminals mounted on a printed circuit board, push button for remote occupant override, and a remote communication port (RJ 11), if required. Sensors shall be capable of including a slide switch that may be used by the occupant to adjust the heating and cooling setpoints as detailed in the I/O list, shown on the plans, or mentioned elsewhere within this specification.
40. Demand Controlled Ventilation (DCV) Sensor:
    a. Space CO2 sensors shall be field supplied and wired to the ATC where shown on the plans, or mentioned elsewhere, to provide a Demand Controlled Ventilation control scheme. The sensor shall utilize a default of 0–2000 PPM range (system shall be capable of supporting a 0–5000 PPM range, as applicable. The sensor shall include an infrared diffusion sampling cell to eliminate pumps and dust filters. The sensor shall be capable of producing a proportional 0–10 VDC control signal.
41. Terminal Damper Actuator:
    a. The ATC shall include a direct-coupled actuator used to control the primary air damper of the air terminal. The actuator shall provide torque limiting to permit the motor to stall at any position without incurring any damage. The actuator shall be factory mounted and wired.
    b. The actuator, compatible with the electronic control signal for the ATC microprocessor, shall be capable of providing a minimum of 35 inch pounds of torque. To insure suitable pressure independent operation, the actuator shall be capable of going from full open to full closed (or vice versa) in 90 seconds, nominal.
    c. The actuator shall contain a potentiometer that shall provide an indication of the damper position for the ATC. The potentiometer shall provide a linear range of resistance reading over the entire range of the actuator. The ATC shall include an input channel that shall convert this resistance reading to a percent open value (0–100%). The calculation shall be based on actual damper position and damper rotational range. It shall be reversible via software for counterclockwise or clockwise opening dampers. This shall allow the damper action to be switched (Clockwise open or Clockwise closed) without removing or re-writing the actuator. Systems that monitor actuator stroke time or position shall not be acceptable. Systems that require rewiring the damper actuator to reverse direction shall not be acceptable. The damper feedback shall also be used by a system static pressure reset algorithm and for air flow sensor zero calibration.
42. Terminal Control Unit Enclosure:
    a. The ATC, if required by code or mentioned elsewhere in the specification, shall be housed within a field supplied and installed enclosure and shall allow for field wiring connections through the use of screw terminals.
43. Terminal Control Unit Power Requirements:
    a. All terminals shall include a factory supplied and wired control transformer, of the appropriate size for the application. The transformer primary shall be provided at the same voltage as the fan or heater as applicable. Units without a fan and electric heat shall include only Class II wiring and a 24 VAC transformer, with the transformer primary voltage as specified (120, 208, 230, 460).
44. Valve Assemblies:
    a. Valve assemblies shall be field supplied and wired to the ATC. Actuators shall be fully compatible with the terminal unit's control signal (Actuators shall be two position or modulating type. See I/O list and/or Sequence of operation for exact requirements).

The valve assemblies shall be sized to provide the required GPM at the pressure drops specified within this specification. All valve assemblies shall be field installed per the valve supplier's instructions by the mechanical contractor. The energy management contractor shall provide all necessary wiring and terminations for proper operation unless otherwise mentioned in section 16000.

b. All wire required for all the items above shall meet all applicable codes and shall be plenum rated.

45. ATC Requirements:

a. Multiple ATC's being serviced by the same air handler shall be networked together. Each ATC shall include an occupancy schedule or may share a global occupancy control for an entire designated group. Each ATC shall also be capable of supporting holiday periods.

b. Each ATC shall include the capability to monitor one space temperature sensor and one space ventilation (CO2) sensor or space relative humidity sensor. Sensor locations and box assignments are shown on the project plans, as applicable.

c. The ATC shall monitor primary airflow, space temperature, air handler status and mode, supply air temperature(as applicable) and shall position its terminal damper based on its PID temperature control algorithm to maintain the desired zone temperature setpoint. Each ATC shall include the inherent ability to override the temperature control loop and modulate the terminal's damper with a PI loop, based on a ventilation sensor or a Relative Humidity sensor with its associated setpoint schedule, in conjunction with the normal temperature control loop. The ATC shall be capable of maintaining a ventilation setpoint through a Demand Controlled Ventilation algorithm in conjunction with the Air Handler to fulfill the requirements of ASHRAE standard, 62-1989 "Ventilation For Acceptable Indoor Air Quality" (including addendum 62a-1990). The algorithm shall also modulate the heat to keep the space temperature between the heating and cooling setpoints if heating is available. The IAQ algorithm shall be suspended if the space temperature falls below the heating setpoint. The system shall also include the capability for a maximum primary airflow limit (ventilation) to protect the zone from over cooling for those units that do not include local heating.

d. For Relative Humidity applications the ATC shall also be capable of overriding the amount of primary air up to an operator adjustable higher CFM value, whenever the space Relative Humidity exceeds its setpoint during the occupied mode, as applicable. Systems that allow simultaneous heating and cooling shall not be acceptable.

e. Depending upon the type of box, the ATC shall also sequence the terminal's fan, hot water valve or auxiliary heat as required. Depending on the equipment mode of operation, separate heat/cool, minimum/maximum, airflow setpoints shall be used to help protect the equipment from insufficient air flow during heating (minimum heating CFM) or overload (maximum heating and maximum cooling CFM) or provide minimum ventilation and air movement (minimum cooling). Auxiliary heating for IAQ applications shall be of the modulating hydronic type. Two position heating devices shall not be acceptable for IAQ applications. All parallel fan powered terminals with local auxiliary heat shall include a heat on delay timer (unless in the commissioning mode) to insure that the use of plenum air is sufficiently exhausted before any mechanical heating stage is enabled. All ducted heat shall be controlled so as not to exceed a user defined maximum duct temperature. All fan powered terminals with local auxiliary heat, shall also include a fan off delay value, to insure that the heat has been sufficiently dispersed before disabling the fan. All timers shall be provided in software. Each space temperature sensor shall include an override push-button as an integral part of the sensor (see I/O list or Sequence of Operation for applicability). Whenever the push-button is pushed during the unoccupied mode the zone shall be indexed to control to its occupied setpoints, the air source shall start and the zone shall stay in

its occupied mode for the duration of the override period. The timed override duration shall be operator configurable from one minute to twenty-four hours in one minute increments.

f. The air source mode shall be used by each zone to determine which minimum and maximum air flow (CFM Limits) requirements to utilize. The start time bias calculated by the air source controller shall be used to adjust the start AHU's occupied time. For those systems that do not directly receive the equipment mode from the equipment controller, the coordinator shall determine the air source mode based on a primary air temperature, its air flow sensor, and its damper position.

g. The ATC that has been designated as the coordinator shall calculate a composite set of occupancy data (based on all terminal schedules in the system) to replace that which was normally used by the occupancy algorithm. The coordinator shall also monitor the damper positions of all of its linked zones and provide the most open damper position value for the pressure reset algorithm. The calculated pressure reset value shall be based upon the position of the most opened damper in the system. The pressure reset value shall be limited to a maximum allowable amount.

h. Each ATC shall automatically calibrate the position of its dampers as part of the commissioning. In addition, the ATC shall perform on-going auto-calibration of the flow sensor whenever the air source is off or after 72 consecutive operating hours have elapsed. The ATC's shall have their automatic calibration modes staggered.

46. System Requirements:

a. The system shall include the ability to configure and display up to 128 zones for each air source. A zone shall be defined as a space temperature sensor wired to an ATC.

b. Configuration:

1) Each zone shall have the ability to configure and display the following:

(a) Minimum/Maximum CFM limits used by the terminal control when the air source is in the cooling mode.

(b) Minimum/Maximum CFM limits used by the terminal control when the air source is in the heating mode.

(c) Reheat CFM limit (single duct units only) used when local heat is required and AHU is in cooling mode.

(d) Parallel fan CFM limit (parallel fan terminals only)

(e) CFM Multiplier (for field calibration, if required)

(f) Inlet probe multiplier

(g) Terminal Inlet size (diameter or square inches)

(h) Offset CFM adjustment

(i) Heating type

(j) Central Heating enabled/disabled

(k) Heat on delay

(l) Fan off delay (parallel terminal fans only)

(m) Maximum duct temperature

(n) Alarm setpoints

(o) Occupancy Override value

(p) Heat/Cool — Occupied/Unoccupied temperature setpoints

(q) Ventilation setpoint (CO_2) and airflow limit

(r) Heat enable/disable

(s) High Relative humidity setpoint and airflow limit.

c. Zone Display:

1) Zones shall have the capability to display the following as a minimum:

(a) Terminal operating mode and terminal type

(b) Zone space temperature

(c) Actual damper blade position (0–100% open)

(d) Primary Airflow in CFM

(e) Primary Air temperature (if applicable)

(f) Terminal fan mode (if applicable)
(g) Heating capacity (0–100%, if applicable)
(h) Leaving temperature (heating only)
(i) Zone CO2 (if applicable)
(j) Zone Relative Humidity (if applicable)
(k) Secondary airflow (if applicable).

d. Maintenance Display:
1) Maintenance screens shall be provided to ease and expedite the task of troubleshooting. The screens shall have the capability to display the following as a minimum:
(a) The current calculated airflow (CFM) setpoint
(b) Occupancy and override status
(c) Current User setpoint offset value
(d) Current heating and cooling setpoints
(e) Heat Status (if applicable)
(f) Ducted heating reference temperature
(g) Heating/cooling BTU's supplied (single duct only)
(h) The current calculated secondary airflow (CFM) setpoint (Zone pressure control applications only)
(i) Current Air Source operating mode and supply temperature
(j) Average zone temperature, average occupied zone temperature, and the next occupied/unoccupied day and time for all terminals serviced by each respective air handler (coordinator only).
(k) Occupancy maintenance screen's shall also display such information as timed override status and duration, current occupied and unoccupied time (local schedule only).
(l) Position of the greatest open primary air damper of all terminals serviced by their respective air handler (coordinator only).
(m) Current calculated static pressure reset value (coordinator only).

e. Linkage:
1) Each ATC shall have the capability to directly communicate to a factory supplied air source microprocessor to provide a totally linked and coordinated Air Distribution System. The linkage shall include the following air source modes for use by the coordinator as a minimum:
(a) Off
(b) Cooling
(c) Heating
(d) Morning Warm-up
(e) Night Time Free Cooling
(f) Pressurization
(g) Evacuation
(h) The linkage shall also provide system data to the air source controller for use in its algorithms. The coordinator shall periodically poll its assigned zones to acquire their updated values. Space temperature and space temperature setpoints acquired by the coordinator for use by the air handler controller shall include a weighted factor, proportional to the size of the zone. Only those zones with valid temperature readings shall be included. Based on this, the system data shall include average zone temperature, average occupied zone temperature, average occupied and unoccupied heat/cool setpoints, occupancy status, and the next occupied zones terminal time and day. A static pressure reset value shall also be supplied for optimization purposes as applicable. Maximum CO2 or space relative humidity shall also be supplied to the air source through other networking means.

(i) The system shall provide the capability of using the above data in the air source algorithms for adaptive optimal start, Night Time Free Cooling, morning warm-up, supply temperature reset, dehumidification, static pressure control and Demand Controlled Ventilation adjustments to the mixed air damper routine.

(j) The air handler controller shall, through the Air Distribution System, bias its occupancy time schedules to provide optimization routines and occupant override.

(k) For those systems that do not include inherent air source linkage software, the coordinator shall determine the operational mode of the equipment through its own flow sensor and a temperature sensor mounted in the supply ductwork.

(l) The vendor shall make it clear in the bid/proposal if linkage software is not going to be part of their offering.

(m) Air Handler – 39L

(n) System Description: 39L Comfort Controller w/GPEX Controller

f. The 39L Comfort Controller Control Panel (GPEX) shall be factory-installed on the supply fan section of Carrier's 39L Air Handler. In addition, this programmable direct-digital controller (DDC) shall be capable of being field installed in a variety of other heating, ventilating, and air-conditioning applications. The user shall configure the GPEX to contain a database of algorithms, points, schedules, alarms, and system functions that are necessary to control and monitor the air-handling unit. The Comfort Controller data shall be configured using the following software interface devices:

g. Service technician’s laptop computer containing the appropriate software

h. Front-end network operator workstation containing the appropriate software

i. System Control Panel Functionality

j. The GPEX controller shall support a wide range of building control applications, including:

1) Mechanical room equipment control, including cooling towers, pumps (lead/lag), boilers, unit heaters and heat exchangers.

2) Scheduling

3) Custom programming

4) Practically any other control process needed in commercial buildings.

5) Facility Management Applications shall include

6) Facility Management Applications shall include:

7) Night Time Free Cooling (NTFC)

8) Adaptive Optimal Start/Stop

9) Power fail restart

10) The control panel shall provide a centralized location for the GPEX control module, which shall be capable of storing hundreds of configuration settings and setpoints. The GPEX module also

11) shall perform self-diagnostic tests at start-up, monitors unit operation, and provides alarms.

k. Physical Characteristics

1) The GPEX controller with enclosure shall consist of the controller assembly mounted in an enclosure compliant with National Electrical Manufacturers Association (NEMA) type-1 standards. The controller shall utilize a dedicated 120 vac, 50 or 60 Hz power supply capable of providing a minimum of 3 amps (but not greater than 20 amps) to the control board. More than one I/O module may be powered by a single circuit, but the actual number of controls connected to one power source shall depend on the installation and power circuit capacity. Power wiring must be run in a separate conduit. Class I power wiring MUST NOT BE run in the same conduit as Class II sensor wiring, control wiring for field-installed devices, or Class I motor starter wiring.

2) All factory-installed electronic control devices shall be terminated inside the control box, which is shall be mounted on the unit's supply fan section.

l. Environmental Limitations

1) Environmental Limitations:

(a) The control box enclosure shall include the CC6400 processor module, circuit breaker, transformers, terminal blocks, low-limit air temperature protection relay and reset, static pressure transducers (VAV option) and high-pressure switch (VAV units). A field-supplied on/off switch allows power shut off to the control box. The control box environmental limitations are as follows:

(1) The electrical power-disconnect and the fan motor starter shall be factory supplied and installed. Connections shall be provided in the control box to wire the starter's HOA (Hand/Off/Automatic) switch.

(2) The factory-wired high-pressure switch (VAV only), low-temperature thermostat relay, fan relay, and terminal block no. 3 shall be live whenever the supply fan starter is powered. The supply-fan motor starter circuit shall be isolated from the control power voltage and can be different from the power circuit voltage.

(3) All electrical components shall be UL (Underwriters' Laboratories) listed. The control assembly shall be listed and labeled by ETL to comply with UL standard 873 for temperature indicating and regulating equipment. Complete air-handling units with factory-installed controls shall be listed and labeled by ETL to comply with UL Standard 1995 for heating and cooling equipment, and comply with NFPA (National Fire Protection Association) Standard 90A. All ETL listings shall be for all factory-supplied controls options. Use of other accessory components shall not be covered under these ETL listings.

(4) HARDWARE

m. A microprocessor module with various factory-installed and field-installed sensors shall be available to provide varying amounts of control within the air-handling system.

n. Processor Module

1) The sensor shall be factory-installed and wired. The sensor shall consist of a thermistor encased within a stainless steel probe and be mounted to a junction box. The junction box and sensor shall be factory-mounted at the discharge of the air handler unit in the supply fan, with the probe mounted to sense the air temperature supplied to the system. The sensor's thermistor has a range of 210 to 245 F with a nominal resistance of 10,000 ohms at 77 F.

(a) Return Air Temperature Sensor

(b) The return-air temperature sensor shall be factory-supplied for field installation in the return air duct. The sensor shall consist of a thermistor encased within a stainless steel probe. The sensor's thermistor shall have a temperature range of –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F.

o. Air Quality Sensor

1) The air quality (AQ) sensor shall be a factory-supplied and field-installed accessory. Two types of sensors may be used; one sensor shell monitor CO2 in the conditioned air space, and the other sensor shall monitor CO2 in the return air duct. Both sensors shall use infrared technology to detect the levels of CO2 present in the air. The CO2 sensors shall be factory set for a range of 0 to 2000 ppm and a linear voltage output of 2 to 10 vdc. Changes to the sensor's factory configuration shall utilize a User Interface Program (UIP) or Sensor Calibration Service Kit.

p. Space Temperature sensor (For CV Units Only)

1) The SPT sensor shall be factory-supplied for field installation. The sensor shall be

installed on an interior wall where the temperature sensed is representative of the entire zone to be serviced by the unit. The space temperature sensor shall have a decorative case and shall feature a push button for remote timed override. An optional sidebar for space temperature adjustment may also be provided. The sidebar range adjustment shall be programmable from 0 to ± 20 F. The sensor shall also provide a communication connector (RJ14-type service jack) concealed behind a removable cover. The sensor shall have screw terminal connector to facilitate wiring. All wiring from the sensor to the unit shall be field-supplied and field-installed. The sensor's thermistor shall have a range of 32 to 120 F with a nominal resistance of 10,000 ohms at 77 F.

q. Outside Air Temperature Sensor
   1) The sensor shall consist of a thermistor encased within a probe. When required, the sensor shall be shipped inside the fan section for field installation in the most appropriate location. It must be attached to a field-supplied conduit or junction box. The thermistor shall have a range of –40 to 245 F and a resistance of 5,000 ohms at 77 F.

r. Static Pressure Transducer and Probe (VAV Units Only)
   1) The static pressure transducer shall be factory-mounted and wired in the control box. The static pressure probe shall be shipped with the GPEX for field installation in the supply duct. The duct static pressure shall be field-piped to the transducer by connecting field-supplied tubing to the bulkhead fitting provided in the GPEX control box. The transducer shall operate on a capacitance principle, and shall convert the sensed static pressure to a 2 to 10 vdc electric signal, which shall be sent to the control module. The static pressure transducer shall have a range of 0.0 to 5.0 in. wg. A transformer located in the control box shall provide all required power.

s. Preheat Temperature Sensor
   1) The preheat temperature sensor shall measure the temperature of the air leaving the preheat coil. The sensor shall be factory supplied and factory installed if ordered with the air-handling unit. The preheat sensor shall be mounted on the downstream side of the unit's first heating coil. The sensor shall consist of multiple thermistors evenly spaced and encased within a flexible copper tube, which shall provide average temperature sensing. The sensor tubing shall be installed on the downstream side of the preheat coil and shall be serpentined so it can sense average temperature. The preheat sensor shall ahve a range of –40 to 245 F with a nominal resistance of 10,000 ohms at 77 F.

t. Low-Temperature Thermostat (LTT)
   1) The low-temperature thermostat shall protect the chilled water from freezing when abnormally cold air passes through the coil. The thermostat shall be factory installed if Coil Freeze Protection is ordered with the air-handling unit. The LTT shall be a factory-installed 20-ft long capillary tube mounted in the airstream on the entering side of the chilled water coil on the leaving air side of the first hot water coil if no cooling is supplied in the equipment. The thermostat-reset mechanism shall be provided inside the control box. The low-temperature thermostat shall have a range of 35 to 60 F and be factory-set to switch at 35 F. The LTT may be field-adjusted to meet the specific job requirements. The thermostat shall be wired to the control box. If any one-foot section of the capillary shall sense air cooler than the thermostat set point, the LTT shall cause the fan to shut down and an alarm is generated. A manual reset inside the control box shall restart the fan after the problem is corrected and the coil temperature has risen by at least 5 F. The location of the reset shall eliminate the need to open the air handler.

u. Space Humidity Sensors
   1) The relative humidity sensors (wall or duct mount) shall be field-supplied and

field-installed accessories. These sensors shall use bulk polymer resistance technology, which eliminates the effect of surface contamination and helps to maintain sensor accuracy over a long period of time. The sensors shall have a long-term stability of less than 1% drift per year. Relative humidity sensors may be used for dehumidification control and for monitoring relative humidity in the occupied space. The wall-mounted relative humidity sensor shall have a decorative case and installed on an interior wall where the relative humidity is representative of the entire zone to be serviced. The duct-mounted relative humidity sensor shall be enclosed in a junction box with the sensing element at the end of a 9-in. probe. The relative humidity sensors shall have a range of 10 to 90%, with an accuracy of ± 3% at 25 C (77 F). They shall generate a 2 to 10 vdc signal which shall be sent to the controller.

v. High Pressure Switch (HPS) (VAV Units Only)
   1) The high-pressure switch shall be a single-pole, double throw (SPDT) snap-acting switch with normally closed contacts wired in series with the fan circuit. HPS shall shut the fan down when the duct pressure exceeds the switch setting. A manual reset shall restart the fan after the problem has been corrected. The high-pressure switch shall be factory-mounted and wired in the control box. The probe shall be field-mounted in the duct. The 1/4-in. OD field-supplied and installed pressure-sensing tubing shall connect the probe in the duct to the control box. The tube must be field-connected to the control box. The switch shall be factory set at 3.0 in. wg and has a range of 1.4 to 5.5 in. wg. The HPS shall be field adjusted to meet specific job requirements.

w. Airflow Switch (AFS) (CV Units Only)
   1) The AFS (sometimes called supply fan status switch) shall monitor airflow from the fan and provide the GPEX control with fan proof signal. The AFS probe shall be factory mounted in the fan discharge. The pressure-sensing tube shall connect the probe to the control box. The probe shall be factory-installed and piped to the supply fan scroll housing. The airflow switch shall be connected to the fan status pick-up probe by 1/4-in. flame retardant tubing. The airflow switch shall be a SPDT snap-acting switch, and factory set at 0.2 in. wg and have an operating range of 0.05 to 10.0 in. wg. The AFC may be readjusted to specific job requirements in the field, if necessary.

x. Differential Enthalpy Control
   1) The Differential Enthalpy control option shall be field-supplied for field-installation in the outside air and return air ducts. Two solid-state enthalpy sensors shall be provided. One sensor shall be used to sense the outside air enthalpy. The second sensor shall be used to sense the return air enthalpy. The differential controller shall monitor the readings of the sensors. The sensors must be installed where the sensing element is freely exposed to the outside air and the return air, but not where excessive moisture or corrosive fumes may damage the sensing elements.

y. Supply Fan relay
   1) The supply fan relay shall be factory wired and installed in the control box. It shall be an SPST relay that provides a normally open contact. The relay shall interface with the motor starter circuit or VFD and allows the fan to be automatically started or stopped when the HOA (Hands-Off-Automatic) switch is in the AUTO position. The contacts shall be silver cadmium oxide and are rated as follows.
   2) 10A at 24 vac resistive
   3) 10A at 115 vac resistive (1/2 hp)
   4) 10A at 230 vac resistive (1 hp)

z. Modulating Mixed Air Damper Actuators
   1) All mixed-air damper actuators shall be factory supplied and installed directly on the damper jackshafts. The actuator(s) shall be factory installed if the MXB

(mixing box) control is ordered with the air-handling unit. All wiring between the actuator and the control box shall be factory provided. The actuators shall consist of an electronically controlled reversible motor equipped with a microprocessor drive. This drive shall provide constant speed regardless of load, which maintains proper position for all dampers. All actuators shall be capable of holding their position at any point in the stroke and moving the dampers in either direction. All actuators shall have a spring return feature that automatically closes the damper to outside air whenever there is a loss of power. The actuators shall provide 95 degrees of rotation and include a graduated position indicator showing –5 to 90 degrees. The actuator shall have manual positioning mechanism for setting any damper position within its rotation.

2) Actuators shall be shipped in the zero position (5 degrees from fully closed) to provide automatic compression against damper gaskets for tight shutoff. When power is applied, the manual mechanism shall be released and the actuator driven toward the fully closed position. The actuator shall memorize the angle where it stops rotating and use this point for its zero position during normal control operations. The manual override shall also provide release physically by using the crank supplied with the actuator.

3) The actuators shall be powered by a Class II Vac transformer and located in the control box.

aa. Chilled Water and Steam Valves

1) Chilled water, hot water, and steam valves shall be available as field-installed accessories. 2-way and 3-way spring return and non-spring return water/steam valves shall be used. The 2-way spring return valves shall be available in both normally closed and normally open types. The 3-way mixing valves shall be used for hot or chilled water. Valves shall be sized properly for the flow and pressure drops shown on the plans

2) Wiring Guidelines

ab. Component Wiring: Each field-installed control device shall come from the factory with installation instructions, including the appropriate wiring guidelines.

ac. System Wiring: Since air-handling systems are normally made up of multiple component sections, control system component wiring shall utilize quick connect snap plugs on wires that run between sections. All devices mounted within the various sections shall connect back to the GPEX mounted on the supply fan section.

2.02 Software

A. Single User Front End

B. Operating Software: Operator Interface Software, Single Terminal

1. Multi-tasking, single user operating software shall be provided for the operator workstation, as shown in the contract documents. The vendor shall provide all required software, including the database. The PC shall be capable of running Either Windows 2000, or XP Professional operating system. All new PCs shall include Windows 2000, or XP operating software.

C. Passwords:

1. The proposed system shall be capable of supporting a minimum of 100 unique operator Energy Management System (EMS) passwords. Each operator shall be assigned an access level. Each access level shall be customized to include the required control functions from the menu of all available functions (i.e., view only, force and auto points). Each operator's access level shall be further customized based on an assignment of control exceptions for each area (i.e., full access in one building, view only access in another, and custom programming in another).

D. Operator Interface:

1. The proposed system shall include screens with standard windows format, commands, menu conventions, and dialog boxes. The operator shall have access to a full array of help displays to assist while on-line, including context sensitive on-line help, based on the current cursor position. The Program Manager shall include a separate group icon for access into the EMS system with Program Item icons for access to an Alarm Manager, Network Manager, Reports, Graphic/Plot Display Manager, Log in/out, and EMS set-up.
2. The operator (if allowed by password) shall be capable of forcing/autoing of EMS points based on a pre-defined schedule setup by the operator.

E. Wizards:
1. The proposed system shall include Help Wizards to assist an inexperienced operator.
2. Help Wizards shall be provided, as a minimum, for the following operator functions:
   a. Reports
   b. Alarms
   c. Trends
   d. ViewSPACE Databoxes
   e. Operator Profiles
   f. Network Manager:
   g. A Network Manager shall graphically display the EMS system, through the use of a directory with a branching structure, similar to the windows file manager. A double click on a network will expand the directory tree and display the areas that make up the network. A double-click on an area shall display the list of controllers, then another double-click of a controller shall display the controller's tables (status, maintenance, configuration, and service). A double-click of the controller's table will result in dynamic updating of applicable values (i.e., point value displays, maintenance values, service information). All system operations shall allow penetration to any system operation by the operator if allowed by password. This shall allow the operator to penetrate to any desired system operation through the use of a hierarchy plan of system graphics or displays.
   h. Point display screens shall include diagnostic information such as; point description, value, units, point status, force status, and an operator entered note for each EMS point. The operator shall be able to sort the controllers list based on address, sort key, or name.
   i. The Network Manager shall also provide the main interface into the EMS networks. The following functions shall be provided as a minimum:
   j. System and Point configuration
   k. Custom unit assignment and generation
   l. Viewing, forcing, or autoing of point status displays and maintenance tables
   m. Assigning/removing controllers to different areas
   n. Modification/copying of table values using DRAG and DROP Windows feature
   o. Ability to create or modify a controller's name and description
   p. Copying and verifying controller configuration
   q. Downloads/uploads and copying of database including batch uploads and downloads
   r. Assigning/modification of operators, operator profiles, and alarm filter and indication preferences
   s. Dynamic Data Exchange (DDE) or equivalent, of controller point values to third party software.
3. Global Function Manager:
   a. A Global Function Manager shall be provided with the EMS software to allow operator(s) the ability to perform global functions, if allowed by their operator profile. When the operator selects the Global Function Manager, they shall be presented with the following global programs, to select from:
   b. Timed Force w/Auto
      1) The proposed system shall allow the operator(s), if allowed by their operator

profiles, to automatically “FORCE” and “AUTO” one or a group of points (any combination of different point types) based on a user specified time. Each group shall include a dialog box that lists all of the applicable points (including name and location), group name, force and auto time, force level, and the value of the force. The system shall support at least 300 separate force groups, as a minimum. A Force group dialog box shall include buttons for new, modifying, or deleting points.

2) The system shall automatically log all success and failures in the System Activity report. If a force or AUTO command fails to be acknowledged ComfortView shall initiate an alarm.

c. Global Occupancy

1) In addition to the stand-alone time scheduling capability specified for each system element, the systems shall provide the capability for a Global Occupancy Time Schedule program. The master time schedules shall replace the local time schedules. The global time schedules shall be provided to allow the operator to quickly and easily override the master time schedules. The global occupancy schedules shall be automatically downloaded to the applicable system elements once a day or the operator may download at any time. Each master time schedule shall be linked to 366 override schedules (one for each day of the year), as required. If the master schedule determines that an override is required the master schedule will be overridden by the override schedule.

2) Central Point Transfer

3) The proposed system shall include the inherent capability to provide for the transfer of point values from one system element to another regardless if it is on a primary or secondary bus. When creating or modifying, the operator shall have the capability to select a SPEEDY ENTRY selection to speed and ease the task of configuration.

4) A point transfer dialog box shall display the read from and write to point names, addresses of the points, the frequency of the transfer, and the status of the last attempt.

d. Alarm Manager

1) The Alarm Manager allows, through the selection of an icon, operator access to system alarms associated with the signed on operator(s) profile. The proposed system shall include the capability to route alarms to specific EMS operators. Alarm filters shall be capable of routing alarms based on families (area, element, and level, including the use of wildcards) of alarms to be presented to each EMS operator. Each operator shall be assigned alarm filters on an area-by-area basis. The system shall also be capable of using alarm filters to route network alarms to a specific printer or printers. The alarm manager shall process all alerts and alarms automatically. The system shall support a minimum of eight levels of alerts and alarms.

2) When the operator has initiated the alarm manager by clicking its icon, the operator shall be presented with an alarm list window that shall allow the operator to easily perform such functions as sorting, printing, suppressing of alarms (timed), jumping to a Graphic/Plot, generating custom messages, exporting alarm files, acknowledging alarms, etc. Command icons shall be provided for the most commonly used operator commands. This includes exporting, printing, copying to clipboard, appending operator notes, exporting alarm files, acknowledging of alarms, deleting of alarms, etc. The Alarm manager shall also dynamically display how many alarms are in the alarm list and viewing buffer, and how the alarms are presently sorted.

3) Each alarm shall include the areas name, controller name, bus and element number, the alarm status and priority, time and date of occurrence, point name and explanatory text, plus a custom message. In addition to the alarm custom

message, an operator entered/modified note shall be available for viewing, printed with the standard alarm message, or copied to the Windows Clipboard. The alarm note toolbar icon will change its characteristics, such that the operator can easily determine if a note was attached to an alarm. Each alarm shall also include command icons to provide the means of quickly jumping to a Graphic/Plot pertinent to the alarm condition, acknowledging alarms, viewing or appending operator notes, etc. The system shall be provided with the capability of providing a Dynamic Data Exchange (DDE) or equivalent, of alarm information to third party software.

4) Alarm Notification
   (a) The proposed system shall be capable of assigning different alarm notification types. One type shall provide an audible tone or WAV file sound based on the type of computer speakers specified. A second type shall notify the operator by displaying a flashing alarm icon along with the level of the alarm (and audible beep). Another method shall be a pop-up window alarm display on top of the current window (and audible beep). The system shall also provide support for critical alarms. When a critical alarm occurs a full screen alarm pop-up window shall cover the existing window.
   (b) The operator shall have the capability of running third party software (e.g., Microsoft Excel, Word, etc.) and still receive alarm indication as described above.
5) Reports
   (a) The Energy Management System shall include the inherent ability to store, view and print energy consumption data, runtime data, and trend analog or digital variables. These reports shall also include a summary of consumption and runtimes. Standard management reports shall be provided as well as the capability to provide custom reports. The operating system shall be multi-tasking such that the operator may select other programs to run in the operating system environment without losing report data. Reports shall be generated automatically or manually as selected by the operator. The daily, monthly, and yearly consumption report shall collect from either a digital or analog input point. The daily, monthly, and yearly runtime report shall allow digital inputs/outputs to be totaled to indicate the total runtime of a piece of equipment. The operator shall be able to reset the runtime total for each input. Trend data shall allow the operator to collect and display events for each digital or analog point. The proposed system shall provide a report panel window with icons for the operator to select from. The operator shall also be able to add an icon to initiate the execution of a custom report from a third party spreadsheet in addition to the supplied standard report icons.
   (b) Standard Windows type toolbars and dialog boxes shall be provided to ease the task of report definition. Dialog boxes shall also be provided to ease the task of report formatting and reports shall be displayed, as they would be printed via a print preview command. The operator shall have the capability to change any value in the report or to hide any row or column in the report through standard Window type commands. The following additional reports shall be available through the File Menu's Print command:
   (c) Additional Reports:
      (1) A list of all controllers in a selected area, including the controller's name, address, and all tables
      (2) A listing of all configuration tables in a controller including its name, description, current value, high and low allowable entries, etc.
      (3) A snapshot of the currently displayed point status, maintenance, or configuration table window
      (4) A listing of Graphic/Plot characteristics

(5) Tenant Billing report (if applicable)
(6) Time Schedule report
(7) The system shall also provide a download error report and a controller vs. database difference report upon operator request.
(8) System Activity Report
(9) The operator shall have the ability to easily create and generate operator activity reports. The report shall have the ability to monitor and log all system operator activities such as; operator login/off, operator forces, modifications to setpoint/time schedules, changes to controllers, areas, etc. DDE POKE commands and DLL interface changes to setpoints or time schedules shall be identified as a third party in the Systems Activity Report.
(10) Graphic/Plot Display Manager
(11) The Graphic/Plot Display Manager (GDM) shall allow the operator the ability to organize and view real time point data from multiple controllers all on one screen. The proposed system shall be supplied with standard and customized HVAC graphics as required. The following image formats shall be supported as a minimum; .BMP, .DIB, .GIF, .JPG, .PCX, .TIF, and .TGA.
(12) The graphic package shall provide for multiple link areas, bookmarks, speed buttons and the ability to command point override values through Window Dialog boxes. The operator shall be able to change text colors and fonts, through standard Window Dialog boxes, for such things as point name, value, alarm, force, etc.
(13) The GDM shall be capable of displaying multiple dynamic system graphics with point values, units, names, alarm status, configuration decisions, setpoints, etc., and also multiple point trends, all on one screen. The GDM shall allow the operator the ability to include and display DDE data from other applications. As point data changes the data to the DDE system or equivalent, shall also automatically update.
(14) The GDM shall also be capable of interfacing to third party DDE "POKE" messages. Third party access to setpoints and time schedules shall be via Dynamic Link Library (DLL)
(15) Each Trend shall include the capability for the operator to select pause, start, autostart on and a minimum sampling period of at least ten seconds.
(16) The GDM shall include standard window menus, tool bars, dialog boxes, drop down lists, etc. The operator shall be able to force or auto point values and watch how the system responds dynamically, all on one screen. The graphics screens shall include the ability to be linked with other graphic screens and shall support animated data boxes. The system shall also include the capability to assign different initial graphics for each operator after logging in. If an operator selects a graphic that represents a remote site, the system shall automatically connect to the remote site without any operator intervention.

(d) Remote Access
(1) The system shall include the capability to permit remote communications to multiple remote EMS sites through phone modems and vendor specific software. When a remote EMS site is connected to the network, the operation of the EMS computer shall be unaffected. Alarms shall continue to be printed and logged to the database.
(2) Log On/Off
(3) After successfully logging in to the Multi-tasking operating system, the operator shall not be granted access into the EMS system until the

selection of the EMS log-in icon is made, and the operator successfully enters the assigned login name and password. (The system shall have the ability to eliminate this second step, if desired by the operator). When the operator has successfully logged in to the EMS system, an EMS logout icon shall be displayed at the bottom of the screen. The system shall also provide the capability to assign each EMS operator an EMS start-up application (i.e., Alarm Manager, Reports, Network Manager, etc.). After logging on to the system this function shall automatically open up to the function defined on start-up. The system shall include the capability to automatically log out an operator after a user specified inactivity time.

(4) The operator shall not need to be logged into the system for alarms to be annunciated or for automatic reports to be generated.

(e) Web Server Front End

(1) Description: Operator Interface Via Web Browser

(2) The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and a stand alone Web Server. The stand alone Web server shall be a compact device capable of routing peer to peer communications of devices on the RS-485 network to either an Ethernet LAN or a telephone line. The Web Server shall be capable of storing all system device definitions within the Web server and shall not require an external system manager, computer, or controller to define or access system control devices. The Web Server will allow users to interface with the network via dynamic color graphics served over the Intranet or Internet via a standard Web Browser. The Web server shall be capable of tabular and graphic displays of mechanical systems, building floor plans, or control devices depicted by point-and-click graphics.

(3) Operator Interface

(4) Furnish one compact Web server interface as shown on the system drawings. Operators shall be able to access all necessary operational information in the system via personal computer utilizing standard Web browser software. Computer and Web browsing software shall not be furnished under this section. The Web server shall reside on the same Peer-to-Peer network as the Building Controllers.

(5) Web Server shall connect via Ethernet to a LAN or to a Phone Line and be able to serve up controller information to up to four simultaneous operators connected via the Ethernet or telephone with standard Web Browsers.

(f) Web Server Hardware:

(1) Furnish one compact Web server router with internal 56k modem and ethernet port for operator computer access. The web server shall have an integrated RS-485 port for connection to the peer to peer controller network. The web server shall not require a permanent keyboard or monitor, however shall have an integrated terminal port for connecting a terminal and keyboard during installation and configuration. The Web server shall allow file transfer of files from another system for use as graphics backgrounds or custom displays.

(g) Web Browser Interaction

(1) The Web server shall be capable of providing the operator, at a Web Browser, with both tabular or graphical pages of controller data. An operator with the proper password level shall be able to change setpoint and occupancy schedules or override points and remove overrides. Dynamic objects shall include analog and binary values, dynamic text,

static text, and animation files. Graphics shall have the ability to show animation by shifting image files based on the status of the object.

(2) Custom Graphics: Custom graphic files may be created with the use of a graphics generation package. Graphics may be downloaded to the Web server to use as graphical backgrounds for Dynamic data sent to a Web browser. A text editor shall be all that is required to combine the custom graphic files with dynamic data points and create custom display pages for an operator accessing the Web server from a standard Web browser.

(3) Graphics Library: Furnish a library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. The library shall be furnished in a file format compatible with the graphics generation package program. Upon connection to the controls system the Web Server shall have the capability to learn the controls system and automatically present default web pages for each controller found.

(4) Alarms. An operator shall be able to access a tabular listing of the systems most recent alarm messages from a standard Web browser. This listing shall include up to 50 of the most recent system alarms from building controllers.

(5) Display Information. An operator shall have the capability to perform basic setup of the Web Server from a standard Web browser. Basic setup shall include learning new controllers that are added to the controls system, setting the time in controllers and changing the display units of the data presented between Metric and Imperial units.

F. Global Application Programs

1. Phone Line Communication - AutoDial

G. Remote Phone Line Communications (TeLINK Option)

1. The TeLINK option consists of a Processor (PSIO) Module equipped with specialized control and communication software. The TeLINK shall permit communications from a remote Building Control System to an Energy Management PC to create a window into the remote network.
2. Communications
3. There shall be two types of communications between the BCS network and the remote Energy Management PC:
4. Telephone calls placed manually by an operator working at the Energy Management PC. Telephone calls shall be placed manually by the operator by selecting the appropriate building from the Energy Management PC's main menu. These shall be made for the purpose of controlling and/or monitoring BCS networks at a remote site or calls placed automatically for the purpose of generating reports.
5. Telephone calls placed automatically by a BCS Autodial Gateway option module. These shall be made for the purpose of reporting alarms and alerts.
6. System Parameters
7. The option shall provide the following system parameters as a minimum:
8. Occupied and unoccupied time schedules. Each time schedule shall support eight periods as a minimum.
9. An occupied and unoccupied phone number or beeper number. The occupied and unoccupied phone number shall contain a back-up phone number.
10. A buffer to store alarms and alerts.
11. Building name/numbers.
12. Alarm priority threshold:
13. Determines the lowest alarm priority level that will be transmitted off-network as soon as it

occurs. Alarms of lower priority shall be treated as alerts and shall not be transmitted until the buffer is full or a chance presents itself to transmit them on a connection established for another purpose.

14. Inactivity connect time:
15. After an operator defined connect time has elapsed, where there has been no communications between the modems, the connection shall be broken. An alarm message shall be generated when this occurs.
16. Modem baud rates:
17. The modems shall automatically negotiate the highest common baud rate when establishing communications.
18. Beeper alarm priority:
19. Determines the alarm threshold priority level associated with dialing to a beeper. Alarms below this level are handled as an alert.
20. Alarm priority level:
21. All alarms with priority levels below the operator configured threshold shall be treated as alerts. As alerts occur, the TeLINK shall store them in a buffer. When the buffer is full, the option shall place the call to a Remote Energy Management PC. If a call is initiated by an alarm, the alerts shall be transmitted at the same time.
22. Primary Bus Diagnostics
23. Each Telink shall also contain software that creates and maintains a directory of all controllers located on its secondary bus. The directory shall contain the name and network address of each controller on the primary bus. The TeLink software shall also regularly perform diagnostic checks to determine if the controllers on the primary bus are functioning correctly. When a diagnostic check indicates that a malfunction exists in a controller, the TeLink shall send an error message on to the primary bus to network user interface devices.

PART 3 EXECUTION

3.01 Execution

3.02 Examination

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Owners Representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Installation (General)
   1. Install hardware and software in accordance with manufacturer's instructions.
   2. Provide all miscellaneous devices, hardware, software, interconnections installation and configuration required to insure a complete operating system in accordance with the sequences of operation and point schedules.
   3. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
   4. Install equipment, piping, and wiring/raceways parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
   5. Location and Installation of Components
   6. Locate and install components for easy accessibility; in general, mount 60 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from Owner’s representative prior to installation.
   7. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.
   8. Identify all equipment and panels. Provide permanently mounted tags for all panels.
   9. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections; sized to suit pipe diameter without restricting flow.

10. Interlocking and Control Wiring
11. Provide all interlock and control wiring. All wiring shall be installed in a neat and professional manner in accordance with Specification Division 16 and all national, state and local electrical codes.
12. Provide wire and wiring techniques recommended by equipment manufacturers.
13. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the Owner's representative prior to rough-in.
14. Provide auxiliary pilot duty relays on motor starters as required for control function.
15. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.
16. All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. All other wiring to be installed in a neat and inconspicuous manner per local code requirements.
17. When a cable enters or exits a building, a surge suppressor must be installed. The surge suppressor shall be installed according to the manufacturer’s instructions.
18. All sensor wiring shall be labeled to indicate the origination and destination of data.

D. Field Services
1. Prepare and start the control system under provisions of this section.
2. Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
3. Provide the capability for off-site monitoring. As a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for 1 year or as specified.
4. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.
5. Provide the Owners Representative an in warranty maintenance proposal.

E. Training
1. Provide training to the owner in the operation of systems and equipment.
2. Provide basic operator training for a minimum of 3 people on all functions of the Operator Interface unit.
3. Provide training, as required, for up to 24 hours as part of this contract.

F. Demonstration
1. Provide systems demonstration of each sub-system.
2. Demonstrate a complete operating system to Owner's Representative.
3. Provide certificate stating that control system has been tested and adjusted for proper operation.
4. Sequenes of Operation

END OF SECTION

SECTION 15941

SEQUENCES OF OPERATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of Operation for:
   1. Multi-zone air handlers
   2. Chillers
   3. Chilled Water Pumps
   4. Boiler
   5. Heating Water Pumps

B. SYSTEM DESCRIPTION
   1. System consists of two multi-zone air handling units (AHU) equipped with a chilled water ciol, heating coil ,and a series of zone dampers providing mixed air to individual spaces. The AHU zone dampers that are controlled by individual zone controllers (ZC).

C. SUBMITTALS
   1. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
      a. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
      b. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
      c. Include at least the following sequences:
         1) Start-up.
         2) Warm-up mode.
         3) Normal operating mode.
         4) Unoccupied mode.
         5) Shutdown.
            (a) Control System Diagrams: submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
            (b) Points List: submit list of all control points indicating at least the following for each point.
            (c) Project Record Documents: Record actual locations of components and set-points of controls, including changes to sequences made after submission of shop drawings.

D. QUALITY ASSURANCE
   1. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed at the State in which the Project is located.

PART 2 PRODUCTS – NOT USED SEE SECTIONS 15926 AND 15929

PART 3 EXECUTION

3.01 General:

A. Each AHU shall be directly controlled by a dedicated stand-alone programmable General Purpose Electronic Controller (GPEC), and shall be capable of being monitored by an EMS.

3.02 Alarms

A. Refer to the Input/Output point summary for alarm definition.

3.03 Zone and AHU Setpoints

A. Individual zone controllers (ZC) shall contain the zone setpoints. The GPEC shall control the AHU in order to provide a variable supply air temperature based on zone needs. Each ZC shall maintain the following setpoints:
   1. Occupied High (Cooling) - 75 F (adjustable)
   2. Occupied Low (Heating) - 70 F (adjustable)
   3. Unoccupied High (Cooling) - 85 F (adjustable)
   4. Unoccupied Low (Heating) - 55 F (adjustable)
   5. Each zone sensor shall be equipped with a setpoint adjustment slidebar to allow the occupant to increase or decrease the room setpoints by 0 F to 5 F (adjustable).

3.04 Supply Fan Control

A. Start/Stop
   1. The start/stop of the AHU supply fan shall be determined by the GPEC internal occupancy schedule, or network schedule broadcast. The AHU Linkage algorithm shall overwrite the internal occupancy schedule regularly with occupancy information received from the master zone controller. The user shall be able to configure the fan start and stop times for each day of the week, and establish the fan-operating mode for holidays in each zone controller. Should linkage communications fail, the GPEC shall use its internal designated schedule as default.
   2. Occupied
      a. The GPEC will enable the supply fan whenever the Linkage function indicates that a zone in the system is in an occupied mode.
      b. Unoccupied
         1) The GPEC shall stop the supply fan whenever the Linkage function indicates that the system is in an unoccupied mode. However, if the lowest or highest space temperature value (as supplied from Linkage) exceeds the weighted unoccupied heating or cooling setpoints, the GPEC will start the supply fan. The supply fan will also start in the unoccupied mode if the NightTime Free Cooling, Adaptive Optimal Start, or Timed Override functions are active.
      c. Night Time Free Cooling
         1) The NTFC w/Enthalpy algorithm shall start the supply fan, and open the outside air damper to pre-cool the space up to seven hours prior to occupancy using only outside air. Once the space is sufficiently cooled, the supply fan will stop and the mixed air dampers will close.
         2) NTFC will not operate if:
            (a) The outside air temperature is below a configured value.
            (b) Space conditions do not warrant it.
            (c) The enthalpy of the outside air is too high.
         3) The NTFC cycle will end whenever the:
            (a) Space temperature is 1°F lower than the weighted average occupied cooling setpoint.
            (b) Space temperature is less than 3°F above the outside air temperature.
            (c) The occupied cycle has begun.
            (d) During the occupied mode, the enthalpy portion of NTFC, will also pre-qualify the outdoor air for use by the economizer algorithm.
         4) Adaptive Optimal Start (AOSS)
            (a) Adaptive Optimal Start (AOSS) shall start the supply fan to cool or heat the space to the occupied setpoint prior to occupancy. Linkage will supply the values of the highest space sensor and the weighted average cooling setpoint for use in the AOSS calculations. AOSS will adjust setpoints and fan start/stop times to ensure that the weighted average occupied setpoint is achieved at the time of occupancy.

5) Timed Override
   (a) The zone space temperature sensor shall be equipped with timed override button to allow the occupant to extend the AHU's occupancy schedule from 1 to 4 hours (adjustable).

B. Mixed Air Dampers
   1. Occupied
      a. When the supply fan is running, the GPEC shall modulate the outside and return air damper. When the NTFC enthalpy calculation determines that outside air conditions are suitable for using atmospheric cooling, the GPEC shall modulate the mixed air dampers to maintain a mixed air temperature equal to the supply air temperature setpoint (plus any reset value) minus 3°F. When the supply fan is enabled and the NTFC enthalpy calculation determines that outside air conditions are unsuitable for using atmospheric cooling, the outside dampers will be held at their minimum position of 20% (adjustable).
      b. Unoccupied
         1) Whenever the supply fan is off, the outside air damper will be fully closed and the return air damper will be fully opened. During morning warm-up, the dampers will be held closed.

C. Cooling Coil Valve
   1. Occupied
      a. Whenever the fan is running, and Linkage indicates that the weighted-average occupied space temperature is above the weighted-average occupied cooling setpoint, the GPEC will modulate the cooling coil valve to maintain 55 F (adjustable) cooling deck temperature setpoint.
      b. Unoccupied
         1) Whenever the supply fan is off, the cooling coil valve will close. If, however, the supply fan is started, the GPEC will modulate the cooling valve, as applicable, until the average space temperature has returned to the required unoccupied cooling deck temperature setpoint

D. Heating Coil Valve
   1. Occupied Morning Warm up Mode
      a. When the supply fan has started for morning warm up, and Linkage indicates that the weighted-average occupied space temperature is below the weighted-average occupied heating setpoint, the GPEC will modulate the heating coil valve to maintain 110 F (adjustable) hot deck temperature setpoint.
      b. Unoccupied Heating
         1) Whenever the supply fan is off, the heating coil valve will close. If, however, the supply fan is started, the GPEC will modulate the heating valve, as applicable, until the Linkage supplied average space temperature has returned to the required unoccupied hot deck temperature setpoint.
      c. Linkage Failure
         1) Should linkage fail, and heating be required, the GPEC will utilize the AHU's resident occupancy and setpoint schedules and the return air temperature sensor to maintain the return air temperature at the appropriate heating setpoint.
      d. High Limit Protection
         1) A high-pressure switch shall be wired in series with the fan starter. It will stop the fan when the duct pressure exceeds the switch setting (adjustable). A manual reset, restarts the unit after the problem has been corrected.
      e. Freeze Protection
         1) The Low temperature detection thermostat shall be wired in series with the fan starter. It will stop the fan, close outside air dampers, and open the heating and cooling coil valves if the sensed temperature in the mixed air stream is below 38

°F(adjustable). A manual reset, returns the unit to normal operation.

3.05 2 Air-Cooled Parallel Chillers, 2-Pumps

A. System Description:
   1. System consists of two air-cooled chillers, each with its own dedicated chilled water pump.

B. General:
   1. Each chiller shall be directly controlled and monitored by its own factory installed microprocessor based Product Integrated Controller (PIC). In addition a Central Plant Controller (CPC) module and network communications bus shall be provided to control the two chillers as a single chilled water plant.
   2. Starting The Chiller Plant
      a. The CPC module shall be capable of activating plant cooling when the time of day has reached an occupied period. The CPC shall determine occupancy based on its internal occupancy schedule, or closure of a set of external contacts, or a network communications command based on airside cooling requirements, or by a plant operator manual timed override during the unoccupied period.
      b. When the occupied period has begun, the CPC shall request the lead chiller to start. The lead chiller shall be established by an operator pre-selected rotational sequence. The lead chiller PIC shall go through a factory-defined pre-start routine that prevents short cycling, checks all chiller safeties, shuts off the oil sump heaters, and start its own chilled water and condenser water pump.
      c. To assure the lead chiller has had a chance to take command of the building load before starting the second chiller, the CPC shall not start the lag chiller until the 30-minute (adjustable) pull down timer has elapsed.

C. Rotational Sequence
   1. The CPC shall establish which is the lead chiller by either a fixed (no rotation) sequence, or by a rotate by runtime (runtime equalization) sequence. The fixed sequence shall be capable of being changed at the operator's convenience. The rotate by runtime sequence shall automatically take place at the configured weekly rotation time and day.

D. Adding and Controlling Plant Cooling Capacity
   1. The CPC shall monitor plant chilled water temperature and chiller status, and activate the appropriate number of chillers to match building load in the following manner:

E. Lead Chiller
   1. Once the pull-down timer has elapsed, the CPC shall regularly monitor the plant supply water temperature, and chilled water setpoint of 45 F (adjustable), and calculate a chilled water control point. The CPC shall regularly transmit to the lead chiller the chilled water control point as well as a KW demand limit. The KW demand limit establishes how much capacity the CPC desires from the chiller.

F. Lag Chiller (After initial pull down conditions are satisfied)
   1. The CPC shall start the lag chiller if the following conditions are true, and the lag start delay timer of 10-minutes (adjustable) has elapsed:
   2. The leaving chilled water temperature is above the chilled water setpoint by 2 0F (adjustable).
   3. The CPC current demand limit is greater than 95%.
   4. The lead chillers temperature pull-down rate is less than 0.5 0F/minute (adjustable) – indicating insufficient capacity to meet the building load.
   5. The lead chiller is not in its low load recycle mode of operation.
   6. In order to provide a smooth transition to 2 chiller operation, the CPC shall unload the lead chiller to 50% (adjustable) before starting the lag chiller. Once the lag chiller has started, the CPC shall command both chillers to provide a "soft start" ramp-up rate of 1% KW/minute (adjustable). After the ramp loading is complete, the chillers shall operate in

parallel to match the building load by responding to the CPC's regularly transmitted control point temperature and KW demand limit.

G. KW Balancing
   1. The CPC shall be capable of being configured for KW balancing. The CPC shall regularly transmit both a KW demand limit (% KW) and a leaving temperature control point to each chiller that shall cause both chillers to draw the same % full load KW while maintaining the plant leaving chilled water temperature setpoint.

H. Chilled Water Reset
   1. The CPC shall be capable of being configured to reset the plant leaving chilled water temperature upward from 45 F to 55 F (adjustable) as the outside air temperature (or other optional temperature sensor) drops from 95 F to 65 F (adjustable). Or, the CPC shall reset the plant leaving chilled water temperature upward from 45 F to 55 F as an external input signal varies from 4 to 20 Ma.

I. New Chiller Inhibit Time
   1. The CPC shall not start the lag chiller when the time of day is less than 30-minutes (adjustable) before the beginning of next unoccupied period.

J. Reducing Plant Cooling Capacity
   1. When the plant load drops off, CPC shall unload the chillers accordingly. If the plant load falls off sufficiently, the CPC shall stop the lag chiller such that the lead chiller can handle the remaining plant load without short cycling. When commanded to stop, the lag chiller PIC shall stop its chilled water and condenser water pump, and stop its chiller.

K. Faulted Chiller or Power Failure
   1. All chiller safeties shall be continuously monitored by each chiller PIC, and the chiller stopped if any should trip. Whenever a chiller fails, an alarm shall be generated and CPC shall command the faulted chiller off, and start the inactive chiller. Should a power failure occur, CPC shall re-establish plant operation automatically upon restoration of power.

L. Stopping The Chiller Plant
   1. When the time of day reaches a scheduled unoccupied period, the CPC shall stop the lag chiller, and 1-minute later, stop the lead chiller. When commanded to stop, each chiller PIC shall stop its chiller, and command its chilled water and condenser water pump to stop. During shutdown, each PIC shall activate its oil sump heaters to minimize refrigerant absorption.

M. Backup Sensors
   1. Should the plant leaving or return water temperature sensor(s) fail, the CPC shall automatically send an alarm and continue to manage plant capacity by using the average of the individual chillers leaving or return water temperatures weighted by chiller capacity.

N. Demand Limiting
   1. The CPC shall be capable of receiving Redline Alert and Loadshed commands through network communication from a Loadshed controller for the purpose of reducing electrical energy consumption. Upon receiving a Redline command the CPC shall set the demand limiter on each active chiller to its current operating %KW, and not allow any additional chillers to start. Upon receiving a Loadshed command the CPC shall further reduce capacity by lowering each chillers demand limit by the configured loadshed demand limit decrease (adjustable)
   2. The CPC shall also be capable of receiving an external 4 to 20 mA demand limit reset signal from another control system and limiting each chiller to the corresponding configurable demand limit.

O. Alarms

1. Each chiller and the CPC shall communicate with and automatically send alarms to the building automation network and alarm printer. Refer to the Input/Output point summary for definition.

P. FREEZE PROTECTION
1. At an ambient outside air temperature of 36 degrees (adjustable), start all chiller pumps and the lead chilled water secondary pump.
2. At an ambient outside air temperature above 40 degrees (adjustable) stop those pumps not required by the loading condition.

3.06 1 Boiler, 1 Pump. 3-Way Reset

A. System Description:
1. System consists of a single-stage boiler, one circulating pump, and a 3-way valve for hot water reset.

B. General:
1. The boiler shall run and maintain a hot water supply temperature setpoint (adjustable) subject to its own internal controls and safeties. The coordinated control of the boiler and its associated pumps and valve shall be accomplished by a dedicated stand-alone programmable General Purpose Electronic Controller (GPEC), and shall be capable of being monitored by an EMS.

C. Alarms:
1. Refer to the input/output point summary for alarm definitions.

D. Two Hot Water Pumps in Normal/Stand-by Arrangement
1. Enabling Pumps
   a. Whenever the outside air temperature is less than 65 F, the pumping station shall be enabled, and the pumps shall operate in a normal/stand-by manner. The normal pump shall start and run first. Whenever the lead pump fails, an alarm shall be set and the normal pump shall be placed in the stop position. Manual intervention is REQUIRED as the stand-by pump services both the chilled water and heating water systems.

E. Boiler Control
1. Sequence
   a. Whenever the outside air temperature is less than 65 F (adjustable) and the actual hot water flow is verified, the single stage boiler shall be enabled. The boiler shall run and maintain a hot water supply temperature setpoint (adjustable) subject to its own internal controls and safeties.
   b. Hot Water Reset Control
      1) When the hot water pump flow switch closes, indicating flow, the GPEC shall modulate the 3-way bypass valve to reset the supply water temperature from 180 F to 130 F as the outside air temperature varies from 0 F to 65 F.
      2) When the hot water pump flow switch opens, the GPEC shall set the bypass valve in the zero bypass position.

F. Master Zone Controller (ZC) Information to Air Source
1. The “Linkage Master” ZC shall poll all the ZCs in a AHU system and “link” them all together into a single virtual load to the air source. In creating this virtual load, the “Linkage Master” ZC shall provide the air source with the following information about the system:
   a. Weighted average temperature of all zones in the system
   b. Weighted average occupied temperature of all occupied zones
   c. Weighted average of all zone setpoints (heat & cool) – (occupied & unoccupied)
   d. Earliest zone occupied mode and last zone unoccupied mode
   e. The information provided by the Master ZC to the air source shall be “weighted” proportionally by the maximum operating CFM of each control zone in the system in

order to provide larger zones more influence in what the air source will provide.

f. Air Source Information to Master Zone Controller

g. The “Linkage Master” ZC shall poll the air source and read the supply air temperature and air source operating mode. Air source operating modes shall include:
   1) Off
   2) Morning Warm-up
   3) Cooling
   4) Heating
   5) Night Time Free Cooling
   6) Pressurization
   7) Evacuation
   8) Operator Initiated Start Time (Biased or Timed override)
   9) Terminal Occupancy Schedule

h. Each Zone Controller (ZC) shall have its own Occupancy Schedule. This schedule shall be user configurable to show when selected days of the week will become occupied, and what to do on holidays. Each individual zone occupancy schedule shall also be configurable to respond to a timed override (adjustable from 1 minute to 24 hours) initiated by a pushbutton on the zone’s room sensor.
   1) Air terminal controllers shall have the capability of being established as the “Global” Occupancy schedule master or as a schedule slave. As such, other ZC occupancy schedules shall change automatically when the “Global” occupancy schedule master is changed.

i. Zone Setpoint Schedule
   1) Each ZC shall contain its own zone adjustable setpoint schedule consisting of Occupied High (72 F) and Low (68 F) values as well as Unoccupied High (85 F) and Low (65 F) values. The High setpoint shall be used for cooling and the Low setpoint shall be used for heating. The Cooling setpoint must always be at least 1F higher than the Heating setpoint and the software will insure that it is. In addition the room sensor slide-bar setpoint adjustment shall be configurable in the ZC to an offset value – adjustable from 0 to 15F.
   2) Each ZC shall have the capability of being established as the “Global” Setpoint schedule master or as a schedule slave. Then, other ZC setpoint schedules shall be changed automatically when the “Global” Setpoint schedule master is changed. Up to sixteen “Global” setpoints shall be available on each bus.

j. Dehumidification Control
   1) The ZC shall be capable of either dehumidification control or Demand Controlled Ventilation control - not both simultaneously. Dehumidification shall commence if any zone with a thermidistat has a dew point higher than 55.1. During dehumidification, if the boiler is de-energized, the ZC will energize the hot water pump and then energize the boiler. If the outside air temperature is higher than 65.0F the GPEC shall modulate the 3-way bypass valve to modulate the supply water temperature to 130.0F.
   2) If the increase in cooling airflow causes the space to fall below the heating setpoint, the controller will suspend dehumidification, and the ZC will modulate the heating and cooling dampers as necessary to meet the zone heating setpoint (adjustable).

k. Demand Controlled Ventilation
   1) The ZC will send a signal to the respective AHU contoller to increase the outside air damper position up to a maximum IAQ CFM (adjustable) in order to prevent the space CO2 level from exceeding the maximum CO2 setpoint during occupied periods when:
   2) The software has been configured to enable IAQ control.
   3) The air source outside air damper is actively providing ventilation.
   4) A space CO2 sensor has been wired to the ZC.

5) The ZC in conjunction with the air source shall fulfill the requirements of ASHRAE standard 62-1989 “Ventilation For Acceptable Indoor Air Quality” (including Addendum 62a-1990).
6) The ZC will then modulate the mixed air zone dampers to provide heating or cooling to the space.

l. Morning Warm-up
1) The “Linkage Master” ZC shall scan all zones and transmits the earliest occupied zone to the air source controller through “Linkage”. Once per day the air source controller shall initiate morning warm-up – using its source of heat to bring the system zones up to temperature prior to occupancy. When the central air source goes into morning warm-up, the “Linkage Master” ZC shall alert all zones scheduled for occupancy that day.
2) The occupied scheduled air terminals shall open their dampers to their maximum heating CFM setting (adjustable) until the zone reaches the configured morning warm-up setpoint. Then, the air terminals shall close their dampers to their minimum heating CFM setting (adjustable).

m. Night Time Free Cooling
1) Between 3 AM and 7 AM in the morning, the air source controller shall initiate the NightTime Free Cooling Routine (NTFC) if conditions are right. When initiated, The Master ZC shall be alerted through “Linkage”, and the Master ZC then will alert all other ZCs in the system to go into their NTFC mode.
2) During NTFC, zone damper controllers shall open their cooling dampers to their full maximum cooling CFM setting (adjustable) until the zone reaches the configured NTFC setpoint. Then, the ZC shall close their cooling dampers to their minimum cooling CFM setting (adjustable).

n. Pressurization
1) When the building dP sensor indicates a negative pressure within the building, the outside air damper shall modulate to obtain positive pressure within the building. This shall occur regardless if the demand control ventilation requirements are met.

G. Alarm Processing
1. Refer to the input/output point summary for alarm conditions.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Engineer.
   2. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
   3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
   4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   7. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

8. Include detailed procedures, agenda, sample report forms prior to commencing system balance.
9. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.
10. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect.
    g. Project Engineer.
    h. Project Contractor.
    i. Project altitude.
    j. Report date.

E. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.04 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.

C. Perform Work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, or registered Professional Engineer experienced in performance of this Work and licensed in the state of Bryan, Texas.

1.05 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

B. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

1.06 WARRANTY

A. Furnish AABC National Performance Guaranty for this project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
    1. AABC MN-1, AABC National Standards for Total System Balance.
    2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
    3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
    4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the City of Bryan.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air and return air dampers for design conditions.

J. Measure temperature conditions across outside air and return air dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.08 SCOPE

A. Equipment Requiring Testing, Adjusting, and Balancing: All equipment listed on the mechanical equipment schedules.
   1. Boilers
   2. Air Cooled Water Chillers
   3. Air Handling Units

4. Fans
5. Air Inlets and Outlets

3.09 MINIMUM DATA TO BE REPORTED

A. Report:
1. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence
   d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e. Nomenclature used throughout report
   f. Test conditions
2. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Range
   f. Calibration date

B. Electric Motors:
1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

C. V-Belt Drives:
1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

D. Pumps:
1. Identification/number
2. Manufacturer
3. Size/model
4. Impeller
5. Service
6. Design flow rate, pressure drop, BHP
7. Actual flow rate, pressure drop, BHP
8. Discharge pressure
9. Suction pressure
10. Total operating head pressure
11. Shut off, discharge and suction pressures
12. Shut off, total head pressure

E. Combustion Equipment:
1. Boiler manufacturer
2. Model number

3. Serial number
4. Firing rate
5. Overfire draft
6. Gas flow rate
7. Percent carbon monoxide (CO)
8. Percent carbon dioxide (CO2)
9. Percent oxygen (O2)
10. Percent excess air
11. Flue gas temperature at outlet
12. Ambient temperature
13. Net stack temperature
14. Percent combustion efficiency
15. Heat output

F. Chillers:
1. Identification/number
2. Manufacturer
3. Capacity
4. Model number
5. Serial number
6. Evaporator entering water temperature, design and actual
7. Evaporator leaving water temperature, design and actual
8. Evaporator pressure drop, design and actual
9. Evaporator water flow rate, design and actual

G. Coils:
1. Identification/number
2. Location
3. Service
4. Air flow, design and actual
5. Entering air DB temperature, design and actual
6. Entering air WB temperature, design and actual
7. Leaving air DB temperature, design and actual
8. Leaving air WB temperature, design and actual
9. Water flow, design and actual
10. Water pressure drop, design and actual
11. Entering water temperature, design and actual
12. Leaving water temperature, design and actual
13. Saturated suction temperature, design and actual
14. Air pressure drop, design and actual

H. Heating Coils:
1. Identification/number
2. Location
3. Service
4. Air flow, design and actual
5. Water flow, design and actual
6. Water pressure drop, design and actual
7. Entering water temperature, design and actual
8. Leaving water temperature, design and actual
9. Entering air temperature, design and actual
10. Leaving air temperature, design and actual
11. Air pressure drop, design and actual

I. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

J. Return Air/Outside Air:
1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

K. Exhaust Fans:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

L. Air Distribution Tests:
1. Room number/location
2. Terminal type
3. Terminal size
4. Area factor
5. Design velocity
6. Design air flow
7. Test (final) velocity
8. Test (final) air flow
9. Percent of design air flow

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding components.

B. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Metal frame of the building.
   2. Concrete-encased electrode.
   3. Rod electrodes.

1.02 REFERENCE STANDARDS

A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements for submittals procedures.

B. Product Data: Provide for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. Framatome Connectors International: www.fciconnect.com.

C. Lightning Master Corporation: www.lightningmaster.com.

D. Substitutions: Not permitted.

2.02 ELECTRODES

A. Rod Electrodes: Copper.
   1. Diameter: 3/4 inch.
   2. Length: 8 feet.

2.03 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Exothermic Connections:

C. Wire: Stranded copper.

D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

C. Provide bonding to meet requirements described in Quality Assurance.

D. Bond together metal siding not attached to grounded structure; bond to ground.

E. Provide isolated grounding conductor for circuits supplying personal computers and A/V equipment.

F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

END OF SECTION

SECTION 16070

HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

2.02 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:
   1. Do not use powder-actuated anchors or spring clips.
   2. Concrete Structural Elements: Use expansion anchors.
   3. Steel Structural Elements: Use beam clamps or welded fasteners.
   4. Concrete Surfaces: Use expansion anchors.
   5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
   6. Solid Masonry Walls: Use expansion anchors or preset inserts.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood Elements: Use wood screws.

D. Formed Steel Channel:
   1. Product: Unistrut or equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
   1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
   2. Do not drill or cut structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements for submittals procedures.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. HellermannTyton: www.hellermanntyton.com.

D. Substitutions: Not permitted.

2.02 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets.

C. Letter Size:
   1. Use 1/8 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.

2.03 WIRE MARKERS

A. Description: Vinyl cloth type self-adhesive wire markers.

B. Description: Cloth type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on shop drawings.

2.04 UNDERGROUND WARNING TAPE

A. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.

B. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install nameplates parallel to equipment lines.

B. Secure nameplates to equipment front using screws.

C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION

SECTION 16123

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wire and cable for 600 volts and less.

B. Wiring connectors and connections.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for each cable assembly type.

C. Samples of Actual Product Delivered: Submit one 18 inch length of cable assembly from each reel.
   1. Select each length to include complete set of manufacturer markings.
   2. Attach tag indicating cable size and application information.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

E. Project Record Documents: Record actual locations of components and circuits.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 WIRING REQUIREMENTS

A. Concealed Dry Interior Locations: Use only building wire in raceway.

B. Exposed Dry Interior Locations: Use only building wire in raceway.

C. Above Accessible Ceilings: Use only building wire in raceway.

D. Wet or Damp Interior Locations: Use only building wire with Type THWN insulation in raceway.

E. Exterior Locations: Use only building wire with Type THWN insulation in raceway.

F. Underground Installations: Use only THWN insulation in raceway or service-entrance cable.

G. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

H. Use stranded conductors for control circuits.

I. Use conductor not smaller than 12 AWG for power and lighting circuits.

J. Use conductor not smaller than 16 AWG for control circuits.

K. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

L. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

2.02 WIRE MANUFACTURERS

A. Cerro Wire Inc: www.cerrowire.com.

B. Industrial Wire & Cable, Inc: www.iewc.com.

C. Southwire Company: www.southwire.com.

2.03 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70, Type THHN/THWN.

2.04 METAL CLAD CABLE

A. Description: NFPA 70, Type MC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 60 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

2.05 WIRING CONNECTORS

A. Split Bolt Connectors:

B. Solderless Pressure Connectors:

C. Spring Wire Connectors:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Route wire and cable as required to meet project conditions.
   1. Wire and cable routing indicated is approximate unless dimensioned.

2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.

C. Use wiring methods indicated.

D. Pull all conductors into raceway at same time.

E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

F. Protect exposed cable from damage.

G. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

H. Use suitable cable fittings and connectors.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

J. Clean conductor surfaces before installing lugs and connectors.

K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

L. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

M. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

N. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

O. Trench and backfill for direct burial cable installation as specified in Sections 02315 and 02316. Install warning tape along entire length of direct burial cable, within 3 inches of grade, as specified in Section 16075.

P. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION

SECTION 16131

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.

D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.

I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.

J. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements for submittals procedures.

B. Product Data: Provide for metallic conduit, liquidtight flexible metal conduit, nonmetallic conduit, fittings, and conduit bodies.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.
   1. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:
   1. More than 5 Feet from Foundation Wall: Use rigid steel conduit or thickwall non-metallic conduit.
   2. Within 5 Feet from Foundation Wall: Use rigid steel conduit or thickwall nonmetallic conduit.
   3. In or Under Slab on Grade: Use rigid steel conduit, plastic coated conduit, or thickwall non-metallic conduit.
   4. Minimum Size: 3/4 inch.

C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.

D. In Slab Above Grade:
   1. Use thickwall nonmetallic conduit.
   2. Maximum conduit size in slab: 3/4 inch.

E. Wet Locations: Use rigid steel conduit, rigid aluminum conduit, intermediate metal conduit, or thickwall nonmetallic conduit.

F. Damp locations: Use EMT or intermediate metal conduit where exposed. Use EMT, IMC, or thickwall nonmetallic conduit where concealed.

G. Dry Locations:
   1. Concealed: Use intermediate metal conduit or electrical metallic tubing.
   2. Exposed: Use rigid steel conduit, rigid aluminum conduit, or intermediate metal conduit.

2.02 METAL CONDUIT

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedtube.com.
   2. Beck Manufacturing, Inc: www.beckmfg.com.
   3. Wheatland Tube Company: www.wheatland.com.

B. Rigid Steel Conduit: ANSI C80.1.

C. Rigid Aluminum Conduit: ANSI C80.5.

D. Intermediate Metal Conduit (IMC): Rigid steel.

E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 PVC COATED METAL CONDUIT

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedtube.com.
   2. Thomas & Betts Corporation: www.tnb.com.
   3. Robroy Industries: www.robroy.com.

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

C. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.

D. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.

3. International Metal Hose: www.metalhose.com.
4. Substitutions: See Section 01600 - Product Requirements.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.06 NONMETALLIC CONDUIT

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.

B. Description: NEMA TC 2; Schedule 40 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install steel conduit as specified in NECA 101.

C. Install nonmetallic conduit in accordance with manufacturer's instructions.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 16070.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Do not attach conduit to bleachers or bleacher support steel.

K. Arrange conduit to maintain headroom and present neat appearance.

L. Route exposed conduit parallel and perpendicular to walls.

M. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

N. Route conduit in and under slab from point-to-point.

O. Do not cross conduits in slab.

P. Maintain adequate clearance between conduit and piping.

Q. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

R. Cut conduit square using saw or pipecutter; de-burr cut ends.

S. Bring conduit to shoulder of fittings; fasten securely.

T. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

U. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations, and to cast boxes.

V. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.

W. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

X. Provide suitable pull string in each empty conduit except sleeves and nipples.

Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Ground and bond conduit under provisions of Section 16060.

AA. Identify conduit under provisions of Section 16075.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

END OF SECTION

SECTION 16138

BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2003.

D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2003.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Arc-Co./Division of Arcade Technology: www.arc-co.com.

C. Unity Manufacturing: www.unitymfg.com.

2.02 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

D. Wall Plates for Finished Areas: As specified in Section 16140.

2.03 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.

B. Material: Plastic.

C. Shape: Rectangular.

D. Service Fittings: As specified in Section 16140.

2.04 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 16139.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron.
   2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC".

E. Fiberglass Handholes: Die molded glass fiber hand holes:
   1. Cable Entrance: Pre-cut 6 x 6 inch cable entrance at center bottom of each side.
   2. Cover: Glass fiber weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.02 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Coordinate installation of outlet boxes for equipment connected under Section 16155.

D. Set wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device.

E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
   1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

F. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

G. Maintain headroom and present neat mechanical appearance.

H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling

access panel or from removable recessed luminaire.

J. Install boxes to preserve fire resistance rating of partitions and other elements.

K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

N. Use flush mounting outlet box in finished areas.

O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

R. Use stamped steel bridges to fasten flush mounting outlet box between studs.

S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

T. Use adjustable steel channel fasteners for hung ceiling outlet box.

U. Do not fasten boxes to ceiling support wires.

V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

W. Use gang box where more than one device is mounted together. Do not use sectional box.

X. Use gang box with plaster ring for single device outlets.

Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

AA. Set floor boxes level.

AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.04 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16139

CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

C. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Association; 2005.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Cabinet Keys: Deliver to City of Bryan in accordance with Section 01600 for maintenance materials.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 MAINTENANCE MATERIALS

A. Furnish two of each key.

PART 2 PRODUCTS

2.01 ENCLOSURE MANUFACTURERS

A. Cooper B-Line: www.bline.com.

B. Qube Corporation: www.qubeinc.com.

C. Robroy Industries: www.robroy.com.

2.02 HINGED COVER ENCLOSURES

A. Construction: NEMA 250, Type 1 steel enclosure.

B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.

C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.

D. Enclosure Finish: Manufacturer's standard enamel.

2.03 CABINETS

A. Boxes: Galvanized steel.

B. Backboard: Provide 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.

C. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.

D. Provide metal barriers to form separate compartments wiring of different systems and voltages.

E. Keys: Provide two of each different key.

2.04 TERMINAL BLOCKS

A. Manufacturers:
   1. Allen-Bradley/Rockwell Automation: www.ab.com.
   2. Cooper Bussmann: www.bussmann.com.
   3. WECO Electrical Connectors Inc: www.weco.ca.

B. Terminal Blocks: NEMA ICS 4.

C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

E. Provide ground bus terminal block, with each connector bonded to enclosure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 16070.

C. Install cabinet fronts plumb.

3.02 CLEANING

A. Clean electrical parts to remove conductive and harmful materials.

B. Remove dirt and debris from enclosure.

C. Clean finishes and touch up damage.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Device plates and decorative box covers.

E. Floor box service fittings.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Installation Instructions.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Furnish two of each style, size, and finish wall plate.

B. Provide two protective rings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Wiring Devices: www.cooperwiringdevices.com.

B. GE Industrial: www.geindustrial.com.

C. Leviton Manufacturing, Inc: www.leviton.com.

D. Lutron.

E. Pass & Seymour

2.02 WALL SWITCHES

A. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: Ivory plastic with toggle handle.
   2. Ratings: Match branch circuit and load characteristics.

B. Switch Types: Single pole, double pole, and 3-way.

2.03 WALL DIMMERS - See Section 16510 for fluorescent dimmers

A. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: Ivory plastic with linear slide.
   2. Voltage: 120 volts.
   3. Power Rating: Match load shown on drawings; 1500 watts minimum.

B. Accessory Wall Switches: Match dimmer appearance.

2.04 RECEPTACLES

A. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
   1. Device Body: Ivory plastic.
   2. Configuration: NEMA WD 6, type as specified and indicated.

B. Convenience Receptacles: Type 5 - 20.

C. Single Convenience Receptacles.

D. Duplex Convenience Receptacles.

E. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

F. Isolated Ground Receptacles.

2.05 WALL PLATES

A. Decorative Cover Plates: Smooth stainless steel.

B. Jumbo Cover Plates: Smooth stainless steel.

C. Weatherproof Cover Plates: Gasketed cast metal with in-use covers.

2.06 FLOOR MOUNTED SERVICE FITTINGS

A. Flush Cover Communication Outlets:
   1. Material: Brass.
   2. Configuration: 2-1/8 inch x 1 inch combination threaded opening.

B. Flush Cover Combination Fittings:
   1. Material: Brass.
   2. Configuration: Duplex flap opening with 2-1/8 inch x 1 inch combination threaded opening.

C. Protective Ring: Brass finish.

D. Carpet Rings: Brass.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that outlet boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that floor boxes are adjusted properly.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on bottom.

G. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16138 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above counter.

E. Install dimmer 48 inches above finished floor.

F. Install data and telephone jacks 18 inches above finished floor.

G. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor.

H. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch and dimmer with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

F. Verify that each telephone jack is properly connected and circuit is operational.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16412

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fusible switches.

B. Nonfusible switches.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

C. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Project Record Documents: Record actual locations of enclosed switches.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

D. Substitutions: Not permitted.

2.02 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.
   3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fuses in fusible disconnect switches.

C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.2.

END OF SECTION

SECTION 16426

ENCLOSED CONTACTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose contactors.

B. Lighting contactors.

1.02 REFERENCE STANDARDS

A. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).

B. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993 (R2006).

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide dimensions, size, voltage ratings and current ratings.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Allen-Bradley/Rockwell Automation: www.ab.com.

B. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

C. Square D: www.squared.com.

2.02 GENERAL PURPOSE CONTACTORS

A. Description: NEMA ICS 2, AC general purpose magnetic contactor.

B. Coil operating voltage: 120 volts, 60 Hertz.

C. Poles: As required to match circuit configuration and control function.

D. Enclosure: NEMA ICS 6, Type 1.

E. Accessories:
   1. Pushbutton: ON/OFF.
   2. Auxiliary Contacts: One, normally open.

2.03 LIGHTING CONTACTORS

A. Description: NEMA ICS 2, magnetic lighting contactor.

B. Configuration: Electrically held.

C. Coil operating voltage: 120 volts, 60 Hertz.

D. Manufacturer: TAC Controls - Model DLCU2-32.

E. Poles: As required to match circuit configuration and control function.

F. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.

G. Enclosure: NEMA ICS 6, Type 1.

H. Accessories:
   1. Pushbutton: ON/OFF.
   2. Auxiliary Contacts: One, normally open.

2.04 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 1 normally open contacts in addition to seal-in contact.

B. Pushbuttons: Unguarded type.

2.05 DISCONNECTS

A. Combination Contactors: Combine contactor with disconnect in common enclosure.

B. Disconnects: Thermal magnetic circuit breaker with integral thermal and instantaneous magnetic trip in each pole; UL listed.

C. Disconnects: Fusible switch assembly; NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.

B. Install enclosed contactors plumb. Provide supports in accordance with Section 16070.

C. Height: 5 ft to operating handle.

D. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform applicable inspections and tests listed in NETA STD ATS, Section 7.16.1.

END OF SECTION

SECTION 16443

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 REFERENCE STANDARDS

PART 2 PRODUCTS - ALL PANELBOARDS ARE EXISTING

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide filler plates for unused spaces in panelboards.

B. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

C. Provide engraved plastic nameplates under the provisions of Section 16075.

3.02 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16510

INTERIOR LUMINAIRES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior lighting fixtures and accessories.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts.

E. Fluorescent dimming ballasts and controls.

F. Fluorescent lamp emergency power supply.

G. Lamps.

H. Fixture accessories.

1.02 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Instructions for each product.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Furnish one replacement lamp for each lamp type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lithonia Lighting: www.lithonia.com.

B. Cooper Lightinng

C. As indicated on the drawings.

D. Substitutions: Not Permitted. Two different fixture packages have been pre-approved (the one shown on the drawing and an alternate package available from the Engineer upon request). Other manufacturers having equivalent products will be evaluated only upon written request a minimum of three weeks prior to bid date and a side by side table top presentation of the specified product and the alternate proposed.

2.02 GENERAL REQUIREMENTS FOR INTERIOR LIGHTING FIXTURES

A. Provide products that comply with requirements of NFPA 70 and NFPA 101.

B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Provide accessories and fittings as recommended by manufacturer to properly and completely install and wire fixtures.

D. Electrical Characteristics: 120 volts, 60 Hz, unless otherwise indicated.

2.03 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

2.04 BALLASTS AND CONTROL UNITS

A. Fluorescent Ballasts: Electronic ballast, suitable for lamps specified.
   1. Voltage: Match luminaire voltage.
   2. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.
   3. Substitutions: Not permitted.

B. Fluorescent Dimming Control Units: Linear slide type, rated 2000 watts at 120 volts.
   1. Ballast: Selected by dimming system manufacturer as suitable for operation with control unit.
   2. Lamps: Suitable for lamp type and quantity specified for luminaire.
   3. Substitutions: Not permitted.

C. For emergency power supply and control see Section 16414.

2.05 LAMPS

A. Manufacturers:
   1. GE Lighting: www.gelighting.com.
   2. Philips Lighting Co of NA: www.lighting.philips.com.
   3. Osram/Sylvania.
   4. Substitutions: Not Permitted.

B. Lamp Types: As specified for each fixture.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

C. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

F. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

G. Install recessed luminaires to permit removal from below.

H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Install clips to secure recessed grid-supported luminaires in place.

J. Install wall mounted luminaires, emergency lighting units, and exit signs at height as scheduled.

K. Install accessories furnished with each fixture.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

M. Connect luminaires and exit signs to branch circuit outlets provided under Section 16138 using flexible conduit.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

O. Bond products and metal accessories to branch circuit equipment grounding conductor.

P. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

3.02 FIELD QUALITY CONTROL

A. Operate each fixture after installation and connection. Inspect for proper connection and operation.

3.03 ADJUSTING

A. Aim and adjust fixtures as directed.

B. Position exit sign directional arrows as indicated.

3.04 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate fixture operation for minimum of two hours.

3.06 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.07 SCHEDULE - See Drawings

END OF SECTION

SECTION 16520

EXTERIOR LUMINAIRES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires and accessories.

1.02 REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.

B. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Test Reports: Indicate measured illumination levels.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Maintenance Data: For each luminaire.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Furnish one of each type and wattage lamp installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lithonia.

B. As specified on the drawings.

C. Cooper Lighting

2.02 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

B. Substitutions: See Section 01600 - Product Requirements.

2.03 BALLASTS

A. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide lamp ballast, suitable for

lamp specified.

1. Voltage: Match luminaire voltage.
2. Substitutions: See Section 01600 - Product Requirements.

2.04 LAMPS

A. Manufacturers:
   1. GE Lighting: www.gelighting.com.
   2. Philips Lighting Co of NA: www.lighting.philips.com.
   3. Obtain lamps from luminaire manufacturer.
   4. Osram/Sylvania

B. Lamp Types: As specified for each luminaire.

C. High Intensity Discharge (HID) Lamps:
   1. Product: Pulse Start, where indicated
   2. Substitutions: See Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 501.

B. Install lamps in each luminaire.

C. Bond luminaires and metal accessories to branch circuit equipment grounding conductor.

3.02 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.03 ADJUSTING

A. Aim and adjust luminaires to provide illumination levels and distribution as directed.

3.04 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.05 CLOSEOUT ACTIVITIES

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.06 SCHEDULE - See Drawings

END OF SECTION