

**Fire Station #20
City of Jackson
4445 Medgar Evers
Jackson, Mississippi 39213**

**1/15/2018
PROJECT MANUAL
Revised 1/29/2020**

CCD No. 16004
City No. 15B7003.401

CANIZARO
C•AWTHON
D▼AVIS

Architecture • Planning • Interior Design

Set No.

**January 15, 2018
Revised January 29, 2020**

PROJECT MANUAL



**Fire Station #20
4445 Medgar Evers
Jackson, Mississippi
City of Jackson Project No.
15B7003.401**

CCD Project No. 16004



**CANIZARO CAWTHON DAVIS
Architecture * Planning * Interior Design
129 South President Street
Jackson, Mississippi 39201**

January 15, 2018
Project Manual
Revised January 29, 2020

Fire Station #20
4445 Medgar Evers
Jackson, Mississippi
CCD Project No. 16004
City of Jackson Project No. 15B7003.401

TABLE OF CONTENTS

DIVISION 0 - BIDDING REQUIREMENTS

		Advertisement for Bids and Notice to Contractors
Section	00213	Instructions to Bidders
Section	00300	Information Available to Bidders
		“Attachment A” Asbestos Report Fire Station 20
		“Attachment B” Asbestos Report Other Buildings on Site
Section	00413	Proposal Form
Section	00524	Standard Form of Agreement
Section	00600	Contract Bonds
Section	00650	Certificate of Insurance Instructions
Section	00724	General Conditions
Section	00731	Supplementary Conditions
Section	00732	Special Conditions of the Contract
		“Attachment A” E-Verification (Good Faith Compliance)
		“Attachment B” Federal Labor Standards Provisions
		“Attachment C” Special Provisions and Regulations
		“Attachment D” Equal Business Opportunity (EBO) Plan
		“Attachment E” Davis Bacon Prevailing Wage Rate
		“Attachment F” Excerpts from Code of Federal Regulations Title 24

DIVISION 1 - GENERAL REQUIREMENTS

Section	01100	Summary of Work
Section	01120	Work of Separate Contracts
Section	01140	Work Restrictions
Section	01200	Project Meetings
Section	01220	Applications for Payment
		“Attachment A” Affidavit Certifying Payment to All Subcontractors
Section	01230	Alternates
Section	01250	Change Order Procedures
Section	01298	Schedule of Values
Section	01310	Project Coordination
Section	01325	Construction Schedules
Section	01340	Shop Drawings, Product Data, and Samples
Section	01415	Special Inspections and Testing

Section	01450	Testing Agency Services
Section	01500	Temporary Facilities and Controls
Section	01580	Project Identification and Signs
		Exhibit "A" CDBG Project Sign Requirements
		Exhibit "B" CDBG Project Sign Layout
Section	01630	Substitutions and Product Options
Section	01700	Project Closeout
Section	01710	Cleaning and Site Maintenance
Section	01720	Project Record Documents
Section	01730	Cutting and Patching
Section	01900	Supplemental Project Regulations
Section	01930	Project Sequencing

DIVISION 2 - SITE CONSTRUCTION

Section	02070	Selective Demolition
Section	02230	Site Clearing
Section	02280	Termite Protection Soil Treatment
Section	02300	Earthwork
Section	02315	Trenching and Backfilling For Utilities
Section	02370	Erosion Control
Section	02520	Water Distribution
Section	02530	Sanitary Sewer
Section	02553	Natural Gas Distribution
Section	02630	Storm Drainage
Section	02632	Precast Polymer Trench Drain System
Section	02741	Hot-Mix Asphalt Paving
Section	02742	Asphalt Edge Strip
Section	02751	Concrete Paving
Section	02770	Concrete Walks, Curb and Gutters
Section	02778	Pavement Marking and Signage
Section	02820	Chain Link Fencing
Section	02832	Decorative Metal Fence
Section	02900	Landscape Work
Section	02927	Sodding Lawns
Section	02931	Seeding, Fertilizing, and Mulching

DIVISION 3 - CONCRETE

Section	03100	Concrete Formwork
Section	03200	Concrete Reinforcement
Section	03300	Cast-In-Place Concrete
Section	03600	Floor Leveling Compound

DIVISION 4 - MASONRY

Section	04065	Masonry Grout
Section	04200	Unit Masonry

DIVISION 5 - METALS

Section	05100	Structural Steel
Section	05200	Steel Joists
Section	05300	Steel Deck
Section	05400	Cold-Formed Metal Framing
Section	05500	Miscellaneous Metals

DIVISION 6 - WOOD AND PLASTICS

Section	06100	Rough Carpentry
Section	06200	Architectural Woodwork
Section	06611	Solid Surface Shower Units

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section	07190	Vapor Barrier
Section	07210	Building Insulation
Section	07260	Fluid Applied Membrane Air Barrier
Section	07270	Firestopping
Section	07421	Preformed Metal Panels
Section	07550	Modified Bituminous Membrane Roofing
Section	07600	Flashing and Sheet Metal
Section	07610	Preformed Metal Roofing
Section	07900	Joint Sealants

DIVISION 8 - DOORS AND WINDOWS

Section	08100	Hollow Metal Doors and Frames
Section	08200	Factory Finished Wood Doors
Section	08305	Access Doors
Section	08361	Sectional Overhead Doors
Section	08410	Aluminum Storefront
Section	08520	Aluminum Windows
Section	08700	Finish Hardware
Section	08800	Glazing
Section	08950	Insulated Translucent Wall System

DIVISION 9 - FINISHES

Section	09050	Color Design
Section	09250	Gypsum Drywall
Section	09280	Suspended Gypsum Drywall System
Section	09510	Acoustical Ceilings
Section	09546	Linear Metal Ceiling System
Section	09650	Resilient Base
Section	09670	Resinous Flooring
Section	09672	Decorative Resinous Flooring
Section	09685	Modular Textile Composite Flooring
Section	09900	Painting
Section	09986	Fiberglass Reinforced Plastic Panels

DIVISION 10 - SPECIALTIES

Section	10100	Visual Communication Boards
Section	10170	Solid Plastic Toilet Compartments
Section	10200	Louvers
Section	10240	Architectural Screens
Section	10260	Wall Protection
Section	10290	Insect Screens
Section	10420	Letters and Plaques
Section	10450	Specialty Signs
Section	10452	Truss Emblem
Section	10505	Metal Lockers
Section	10522	Fire Extinguishers
Section	10532	Pre-Engineered Canopies and Walkway Covers
Section	10670	Miscellaneous Specialties
Section	10800	Toilet Accessories and Specialties

DIVISION 11 - EQUIPMENT

Section	11132	Equipment Rack
Section	11452	Appliances

DIVISION 12 - FURNISHINGS

Section	12492	Manual Rolling Window Shades
Section	12500	Furniture

DIVISION 13 - SPECIAL CONSTRUCTION Not Used

DIVISION 14 - CONVEYING SYSTEMS Not Used

DIVISION 15 - MECHANICAL

Section	15011	Basic Plumbing Requirements
Section	15058	Common Motor Requirements for HVAC Equipment
Section	15061	Hangars and Supports for Plumbing Piping and Equipment
Section	15062	Hangars and Supports for HVAC Piping and Equipment
Section	15072	Vibration and Seismic Controls for Fire-Suppression Piping & Equipment
Section	15074	Vibration and Seismic Controls for HVAC Piping and Equipment
Section	15077	Identification for HVAC Piping and Equipment
Section	15083	Plumbing Piping Insulation
Section	15086	Duct Insulation
Section	15091	Sleeves and Sleeve Seals for Fire-Suppression Piping
Section	15110	Plumbing Valves
Section	15122	Meters and Gauges
Section	15140	Domestic Water Piping
Section	15150	Sanitary Waste Vent Piping
Section	15195	Facility Natural-Gas Piping
Section	15375	Sprinkler and Standpipe Systems
Section	15380	Electrical-Drive, Vertical-Turbine Fire Pumps
Section	15410	Plumbing Fixtures
Section	15430	Plumbing Specialties
Section	15530	Furnaces
Section	15738	Split-System Air-Conditioners
Section	15815	Metal Ducts
Section	15820	Air Duct Accessories
Section	15838	HVAC Power Ventilators
Section	15855	Diffusers, Registers, and Grilles
Section	15950	Testing, Adjusting, and Balancing for HVAC

DIVISION 16 - ELECTRICAL

Section	16050	Common Work Results for Electrical
Section	16060	Grounding and Bonding for Electrical Systems
Section	16073	Hangers and Supports for Electrical Systems
Section	16075	Identification for Electrical Systems
Section	16120	Medium-Voltage Cables
Section	16130	Raceways and Boxes for Electrical Systems
Section	16140	Wiring Devices
Section	16145	Lighting Control Devices
Section	16231	Engine Generators
Section	16410	Enclosed Switches and Circuit Breakers
Section	16415	Transfer Switches
Section	16442	Panelboards
Section	16511	Interior Lighting
Section	16521	Exterior Lighting

End

ADVERTISEMENT FOR BIDS AND NOTICE TO CONTRACTORS

Sealed bids will be received by the City Clerk of Jackson, MS, at 219 South President Street, Jackson, MS 39201 or at Post Office Box 17, Jackson, MS 39205 until **3:30 PM, local time, Tuesday, February 25, 2020** at which time bids will be publicly opened and read aloud for:

New Fire Station #20, 4445 Medgar Evers, Jackson, MS 39213
City of Jackson Project No. 15B7003-401

Proposals shall be submitted on forms furnished and sealed and deposited with City Clerk prior to the hour and date above designated. A copy of the construction documents (plans and/or specifications) for the construction being sought has been filed with the City Clerk of Jackson, MS. Official bid Documents can be downloaded from Central Bidding at www.centralbidding.com. Electronic bids and/or reverse bids can be submitted at www.centralbidding.com. For any questions relating to the electronic bidding process, please call Central Bidding at 225-810-4814. Questions regarding plan clarifications or requests for information should be directed to the architect as follows:

Canizaro Cawthon Davis
129 South President Street
Jackson, MS 39213

A copy of the Bid Documents (including plans and specifications for the Work) are being made available via digital and original paper copy. Plan holders are required to register and order bid documents from the Jackson Blueprint Online Plan Room website <http://planroom.jaxblue.com>. There is no charge for registration or to view the bid documents online. Bid documents are non-refundable and must be purchased through the website. All plan holders are required to have a valid email address for registration. A printed bid set is approximately \$130.00 plus shipping and applicable sales tax and an electronic downloadable set is \$20.00 plus applicable sales tax. For questions regarding website registration and online orders please contact Jackson Blueprint & Supply at (601)353-5803.

The City of Jackson hereby notifies all bidders that in compliance with Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. 2000d to 2000d-4 that all bidders will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

The City of Jackson is committed to the principle of non-discrimination in public contracting. It is the policy of the City of Jackson to promote full and equal business opportunity for all persons doing business with the City. As a pre-condition to selection, each contractor, bidder or offeror shall submit a completed and signed **Equal Business Opportunity (EBO) Plan Application**, with the bid submission, in accordance with the provisions of the City of Jackson's Equal Business Opportunity (EBO) Executive Order. Failure to comply with the City's Executive Order shall disqualify a contractor, bidder or offeror from being awarded an eligible contract. For more information on the City of Jackson's Equal Business Opportunity Program, please contact the Division of Equal Business Opportunity at 601-960-1856. Copies of the Executive Order, EBO Plan Applications and a copy of the Program, as attached, are available at 200 South President Street, Second Floor, Jackson, Mississippi.

The City of Jackson, Mississippi (“City of Jackson”) is committed to cultivating and ensuring the quality of life of its citizens, through various programs, employment, initiatives, and assistance. The City encourages all persons, corporations, and/or entities doing business within the City, as well as those who seek to contract with the City on various projects and or conduct business in the City, to assist the City in achieving its goal by strongly considering City residents for employment opportunities.

Bid preparation will be in accordance with the Instructions to Bidders bound in the project manual. The City of Jackson reserves the right to reject any and all bids and to waive any and all irregularities in respect to any bid submitted or to accept any proposal which is deemed most favorable to the City of Jackson.

A PRE-BID CONFERENCE WILL BE HELD

The Notice of the Pre-Bid Conference date, time and place will be issued by Addendum. All Contractors who intend to submit “BIDS” are encouraged to attend.

Robert K. Miller
Director of Public Works

Vanessa Henderson
Deputy Director
Housing & Community Development

This Legal Notice will appear in the *Jackson Advocate*, *Northside Sun*, *La Noticia*, *Clarion Ledger* and the *Mississippi Link* on Thursday December 26, 2019 and Thursday January 2, 2020.

SECTION 00213

INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.1 OWNER

City of Jackson City Council
Office of the City Clerk
City of Jackson City Hall
219 South President Street
Jackson, Mississippi 39201

1.2 ARCHITECT

Canizaro Cawthon Davis
129 South President Street
Jackson, Mississippi 39201

1.3 THE PROJECT

City of Jackson
Fire Station #20
4445 Medgar Evers
Jackson, Mississippi 39213
CCD No. 16004

1.4 QUESTIONS

- A. Questions shall be directed to the Design Professional. Should a Bidder find discrepancies in, or omissions from the plans and specifications, or be in doubt as to their meaning, the Bidder shall immediately notify the Design Professional in writing. The Design Professional will send written instruction(s) or interpretation(s) to all known holders of the documents. Neither the Owner nor the Design Professional will be responsible for nor bound by any oral instruction or interpretation.
- B. Any addenda to the plans and/or specifications issued before or during the time of bidding will become a part of the Contract and receipt of same must be acknowledged by Bidder in his proposal. Failure to acknowledge all addenda shall cause Bidder's proposal to be rejected as nonresponsive.

1.5 BIDDER'S QUALIFICATIONS

- A. The Owner may make such investigation as he deems necessary to determine the ability of the Bidder or subcontractors or suppliers to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and/or to complete the work contemplated therein within the time required.
- B. The Bidder is specifically advised that any person, firm or other party to whom it

proposes to award a subcontract or purchase order under this Contract must be acceptable to the Owner.

1.6 CERTIFICATE OF RESPONSIBILITY

- A. Each Bidder submitting a bid in excess of \$50,000.00 on public projects and in excess of \$100,000.00 on private projects must show on his bid and on the face of the envelope containing the bid, his Certificate of Responsibility Number, as required by Sections 31-3-5 and 31-3-21 of the Mississippi Code of 1972, as revised. If the bid does not exceed the amount of \$50,000.00 on public projects or \$100,000.00 on private projects, a notation so stating must appear on the face of the envelope.
 - 1. When multiple contractors submit a joint venture bid in excess of \$50,000.00 on public projects or \$100,000.00 on private projects, a Joint Venture Certificate of Responsibility Number is required on the bid and face of the envelope. If the Joint Venture has no Joint Venture Certificate of Responsibility number, then each member of the Joint Venture must indicate their individual Certificate of Responsibility numbers on the bid and on the face of the envelope.
- B. Each Subcontractor whose Subcontract exceeds \$50,000.00 on public projects and \$100,000.00 on private projects shall have a Certificate of Responsibility Number, as required by Sections 31-3-15 and 31-3-21 of the Mississippi Code of 1972, as revised.
- C. No bid will be opened, considered or accepted unless the above information is given as specified. Sufficient evidence that said Certificate of Responsibility has been issued and is in effect at the time of receiving bids must be submitted when required by the Owner or the Architect. Likewise, it shall be the responsibility of the Prime Contractor to require a Certificate of Responsibility Number from any subcontractor where applicable.

1.7 DISQUALIFICATION OF BIDDER: The Owner reserves the right to award to other than the low Bidder when, in the Owner's judgment, it is in his best interest to do so. A Bidder may be disqualified for such reasons as:

- A. Bidder's failure to comply with requirements regarding Certificates of Responsibility.
- B. Bidder's failure to sign Bidder's Proposal Form, Section 00413, or to otherwise properly complete the Proposal Form.
- C. Bidder being in arrears on existing contracts.
- D. Bidder being in litigation with the Owner.
- E. Bidder having defaulted on a previous contract.
- F. Bidder having performed unsatisfactorily on a previous contract, including but not limited to the Bidder's failure to fulfill the warranty obligations of a previous contract with the Owner.

The above is not an inclusive list.

- 1.8 CONDITIONS OF WORK: Each Bidder must fully inform himself of all conditions relating to the construction of the Project and employment of labor thereon. Failure to do so will not relieve a successful Bidder of obligations to furnish all material and labor necessary to carry out the provisions of the Contract. Insofar as possible, the Bidder must employ methods, or means, which will not cause interruption of, or interference with, the work of any other Bidder, or Contractor.
- 1.9 EXAMINATION OF SITE: All Bidders, including subcontractors, shall visit the Project site, compare the plans and specifications with any work in place and be informed of all conditions. Failure to visit the site will in no way relieve the successful Bidder from furnishing any materials or performing any work required to complete work in accordance with the plans and specifications without additional cost to the Owner.
- 1.10 LAWS AND REGULATIONS: The Bidder must comply with applicable laws, rules and regulations of all authorities having jurisdiction over the Project at no additional costs to the Owner whether such laws, ordinances, rules and regulations are adopted or enacted before or after bid opening.
- 1.11 OBLIGATION OF BIDDER: At the bid opening, each Bidder will be presumed to have inspected the site, read and become thoroughly familiar with the plans and specifications, including all addenda.
- 1.12 BID DOCUMENTS: Bidders can receive a copy of the bid documents for a refundable deposit of \$200.00. Bidders should contact the Office of the Architect for instructions as to how to obtain bid documents.
- 1.13 PRE-BID CONFERENCE: A pre-bid conference will be held on January 28, 2020, at 10 AM in the Andrew Jackson conference at the City of Jackson offices at 200 South President Street, Jackson, Mississippi.

PART 2 - PROPOSAL FORM

2.1 METHOD OF BIDDING:

- A. Lump sum bids received from General Contractors which shall include general, mechanical, electrical and site work as well as other work shown on and reasonably inferable from the plans and specifications.
- B. Listing of Subcontractors and Suppliers:
1. So that the Owner may be assured that only qualified and competent subcontractors and suppliers will be utilized on the Project and to prevent "bid shopping" and/or "bid-chopping", each Bidder shall identify the name of the subcontractors used by the Bidder in his bid for each subcontractor listed on the Proposal Form. Bidder's subcontractor list shall be provided on the listing form provided on the Proposal Form. A Bidder's failure to indicate the name(s) of the subcontractors included in his lump sum price shall result in the rejection of the Bidder's bid as nonresponsive.
 2. The successful Bidder shall use the subcontractor and supplier identified by him as being included in his lump sum price, provided however the Bidder assumes the risk that the subcontractor or supplier listed will be acceptable to the Owner and the Design Professional. The Bidder shall

not substitute another subcontractor or supplier unless agreed to in writing by the Owner.

3. If Bidder lists itself as a supplier for any of the classifications listed, then the Bidder will be required to furnish such product from its manufacturing inventory and to demonstrate to the Owner and Architect that it has satisfactory qualifications and prior experience manufacturing and furnishing such materials, equipment and/or products. If Bidder lists itself as a subcontractor for any of the classifications listed, then the Bidder will be required to perform the work with its own regularly employed personnel and to demonstrate to the Owner and Architect that it has satisfactory qualifications and prior experience performing such work with its own regularly employed personnel.
4. The Owner reserves the right to reject any bid if the evidence submitted by Bidder fails to satisfy the Owner that the Bidder has satisfactory qualifications and prior experience performing such work and/or furnishing such materials, equipment and/or products.

2.2 PROPOSAL FORMS

- A. The Bidder shall submit its proposal on forms provided and shall fill all applicable blank spaces without interlineation or alteration and must not restate the work to be done. No oral or telegraphic proposals will be considered.
- B. By submission of its bid, Bidder agrees to commence work on or before the date specified in a written notice to proceed and to fully complete the work within the time stated in the bid proposal form.
- C. The Bidder shall submit the

2.3 ALTERNATES: The Proposal Form shall contain a brief description of each alternate modifying the scope. The Bidder shall write out the amount in words and include the numerical amount for each alternate. The written word shall govern.

2.4 SUBSTITUTIONS: No substitutions, qualifications or redefining of the Specification requirements are allowed to be marked on the Proposal Form, unless specifically required by the Bid Documents.

2.5 BIDDER IDENTIFICATION

- A. Signature: The Proposal Form shall be signed by any individual authorized to bind the Bidder.
- B. Name of Bidder: The name appearing on the Proposal Form should be the same as the name appearing in the current Mississippi State Board of Contractors Roster.
- C. Legal Address: The address appearing on the Proposal Form should be the same address appearing in the current Mississippi State Board of Contractors Roster.
- D. Certificate of Responsibility Number(s): The Certificate of Responsibility Number(s) appearing on the Proposal Form should be the same number appearing in the current Mississippi State Board of Contractors Roster.

- 2.6 BID SECURITY: The Bid Security, which must accompany each Bid shall be in the form of a Bid Bond, or a Certified Check:
- A. Bid Bond: The Bidder may submit a Bid Bond by a Surety licensed in Mississippi in the amount of five percent (5%) of the base Bid. The Bid Bond shall be duly executed by the Bidder, the Surety and a Mississippi resident agent. (No standard form is required for the Bid Bond.)
 - B. Certified Check: The Bidder may submit a certified check payable to Owner in the amount of five percent (5%) of the base Bid. All checks received from Bidders will be returned upon request, unless a Bidder is one (1) of the three (3) apparent low Bidders. The three (3) apparent low Bidder's' checks will be held for forty-five (45) days, unless a Contract is awarded and executed in less time.
- 2.7 POWER OF ATTORNEY: Each bid bond must be accompanied by an appropriate Power of Attorney.
- 2.8 NON-RESIDENT BIDDER: When a Non-resident Bidder (a Contractor whose principal place of business is outside the State of Mississippi) submits a bid for a Mississippi public works project, one of the following is required and shall be submitted with the Proposal Form:
- A. Copy of Law: If the Non-resident Bidder's state has a Resident Bidder Preference Law, a copy of that law shall be submitted with the Proposal Form.
 - B. Statement: If the state has no such law then a statement indicating "*the State of (Name of State) has no resident Contractor preference law*" shall be submitted with the Proposal Form.

PART 3 - SUBMITTING THE PROPOSAL FORM

- 3.1 SUBMITTAL: A bid must be delivered to the address indicated on the Advertisement for Bids prior to the time and date stated for opening of Bids. Bids shall be submitted in sealed opaque envelope marked, mailed or hand-delivered as follows:

Name of Bidder
(As it appears in the current Mississippi
State Board of Contractors Roster)

C/o
Office of the City Clerk
City of Jackson City Hall
219 South President Street
Jackson, Mississippi 39201

Bid for: Fire Station 20, City of Jackson, 445 Medgar Evers, Jackson, Mississippi
Certificate of Responsibility # _____

If the Bid is mailed, the bid envelope shall be placed inside a second envelope to prevent inadvertent premature opening of the Proposal.

A. Bidders have the option to submit electronic bids which can be submitted at the web address indicated on the Advertisement for Bids.

- 3.2 MODIFICATION TO BID: A Bidder may modify his bid by telegraphic communication at any time provided such communication is received by the Owner prior to the scheduled time for opening of bids as indicated in the Advertisement for Bids. Written confirmation must be received within two days from the bid opening or no consideration will be given such modification.
- 3.3 MODIFICATION ON ENVELOPE: A modification or qualification to the bid written on the outside of the sealed envelope containing the bid will not be accepted.
- 3.4 WITHDRAWAL OF BID: Any bid may be withdrawn prior to the scheduled time for opening of bids or authorized postponement of same. Any bid received after the date and time specified will not be considered. However, bids received at the scheduled time constitute irrevocable offers to contract at the price in the bid and may not be withdrawn until sixty (60) days after opening of bids.

PART 4 - BID OPENING AND AWARD OF CONTRACT

- 4.1 OPENING OF BIDS: Bids will be opened at the time stated in the Advertisement for Bids.
- 4.2 IRREGULARITIES: The omission of any information requested on the Proposal Form may be considered as an informality, or irregularity, by the Owner when in his opinion the omitted information does not alter the amount contained in the submitted bid proposal, or place other Bidders at a disadvantage.
- 4.3 ERRORS: Any claim of error and request for release from bid must be delivered in writing to the Owner within twenty-four (24) hours after the bid opening. The Bidder shall provide sufficient documentation with the written request clearly proving an error was made and the Bidder's intended bid.
- 4.4 AWARD OF CONTRACT: The Owner reserves the right to reject any or all bids, and to waive any and all irregularities. If awarded, a contract will be awarded to a responsible Bidder whose responsive bid proposal is the lowest and best bid.
- 4.5 FAILURE TO ENTER INTO A CONTRACT: The Bidder shall forfeit the Bid Security to the Owner as liquidated damages for failure, or refusal, to execute and deliver the Contract, Bond and Certificate of Insurance within the required ten (10) days after notice of the acceptance of the bid.
- 4.6 SECURITY FOR FAITHFUL PERFORMANCE: Simultaneously with delivery of the executed Contract, the Contractor will furnish Performance and Payment Bonds, as security for faithful performance, the payment of all persons performing labor on the project, and furnishing materials in connection with this Contract. The Surety on such Bonds will be a duly authorized surety company licensed to do business in Mississippi and satisfactory to the Owner and meeting all of the following requirements:

- A. Licensed at the time of award by the State of Mississippi's Commissioner of Insurance for the purpose of providing surety.
- B. Listed at the time of award in the Department of the Treasury's Federal Register as a company holding certificates of authority as acceptable sureties on Federal Bonds, commonly referred to as the Treasury List.
- C. All Bonds shall be executed on the form acceptable to Owner.
- D. All Bonds shall be countersigned by a Mississippi resident agent with the name and address typed, or lettered legibly.
- E. All Bonds must be accompanied by an appropriate Power of Attorney.

PART 5 - BIDDER'S CHECKLIST

The following checklist is for the Bidder's assistance only. It is not inclusive and is not a part of the bid documents. Therefore, this checklist should not be included with the Proposal Form when submitting a bid proposal.

5.1 PROPOSAL FORM

Base Bid

() Write in the amount of the base bid in words and numbers.

Alternates

() Write in each alternates amount in words and numbers.

Addenda

() Acknowledge the receipt of each addendum by writing in the number of the addendum and the date received.

Acceptance

- () Proposal is signed by authorized person
- () Name of Business as it appears in the current Mississippi State Board of Contractors Roster
- () Legal address of the business listed above
- () Correct Certificate of Responsibility Number(s) as it appears in the current Mississippi State Board of Contractors Roster

Certificate of Responsibility Number(s)

- () Base Bid is under \$50,000 and the statement "bid does not exceed \$50,000" is on the outside of the bid envelope
- () Base Bid is over \$50,000.00 on public projects or \$100,000 on private projects and number is required

() Joint Venture and *joint venture* number is required
or

() Joint Venture participants' numbers are required

5.2 BID SECURITY

() Included Bid Bond

or

() Included Certified Check

5.3 POWER OF ATTORNEY

() Included Power of Attorney for Bid Bond

5.4 PREFERENCE LAW (see Paragraph 2.8, Non-Resident Bidders)

() Attached a copy of Non-Resident Bidder's Preference Law

Or () Attached a statement

END OF SECTION

SECTION 00300

INFORMATION AVAILABLE TO BIDDERS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section references information available to the bidders that is not a part of the Contract Documents.
1. Geotechnical Investigation
 - a. The Geotechnical investigation, including subsurface and soil boring data and related reports prepared by SoilTech Consultants, 101 Business Park Drive, Suite A, Ridgeland, MS 39157, July 19, 2017 have been used by the Architect/Engineer in preparation of the foundation design. This report is referenced for information only and is not a part of the Contract Documents.
 - b. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations, quantities or conclusions drawn therefrom by Contractor. Data are made available for the convenience of the Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
 2. Asbestos Containing Materials
 - a. The Asbestos Containing Materials Report for the existing Fire Station 20, including related reports prepared by Advanced Environmental Consultants, Inc., P.O. Box 16847, Jackson, MS 39236, dated April 11, 2014 have been used by the Architect/Engineer in preparation of the documents. This report is referenced for information only and is not a part of the Contract Documents. See attached following this Section.
 - b. The Asbestos Containing Materials Report for other existing structures on the Fire Station 20 lot, including related reports prepared by Advanced Environmental Consultants, Inc., P.O. Box 16847, Jackson, MS 39236, dated September 7, 2017 have been used by the Architect/Engineer in preparation of the documents. This report is referenced for information only and is not a part of the Contract Documents. See attached following this Section.
 3. Property Survey
 - a. The Property Survey prepared by H D Lang and Associates, Inc., P.O. Box 16085, Jackson, MS 39236 dated September 9, 2016 has been used by the Architect/Engineer in preparation of the

documents. This survey is referenced for information only and is not a part of the Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION



Advanced Environmental Consultants, Inc.
Project Managers and Scientists

Limited Asbestos Inspection



***Fire Station #20 INS #035
4445 Medgar Evers Blvd.
Jackson, MS 39213***

Prepared for:

***The Jones Group
407 Briarwood Drive, Suite 203
Jackson, MS 39206***

Project AEC 009.14

April 11, 2014

P. O. Box 16847
Jackson, MS 39236-6847

Phone: (601) 362-1788

Fax: (601) 362-3967

Email: aecinc@advancedenviroconsultants.com
www.advancedenviroconsultants.com

5450 Executive Place, Suite 2A
Jackson, MS 39206

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 SUMMARY	1
2.0 INTRODUCTION	1
3.0 SCOPE OF SERVICES AND LIMITATIONS	1
3.1 SCOPE OF SERVICES	1
3.2 LIMITATIONS AND WARRANTY	2
4.0 DESCRIPTION OF SUBJECT PROPERTY	2
4.1 SETTING AND LOCATION	2
5.0 ASBESTOS IDENTIFICATION SURVEY	2
5.1 DESCRIPTION OF SAMPLED AREAS	2
5.2 SAMPLING METHODOLOGY	2
5.3 SAMPLING LOCATIONS	2
5.4 SAMPLE HANDLING AND ANALYSIS	2
5.5 ASBESTOS ANALYTICAL RESULTS	3
6.0 FINDINGS AND CONCLUSIONS	3
7.0 RECOMMENDATIONS	3
8.0 GENERAL COMMENTS	3

FIGURES

FIGURE 1	INTERIOR OF BUILDING
FIGURE 2	ROOF

APPENDICES

APPENDIX A	CERTIFICATION AND LICENSES
APPENDIX B	ASBESTOS ANALYTICAL RESULTS
	CHAIN-OF-CUSTODY FORMS
APPENDIX C	SITE PHOTOGRAPHS

LIMITED ASBESTOS INSPECTION SERVICES

Fire Station #20
4445 Medgar Evers Blvd.
Jackson, MS 39213

Project No. AEC 009.14

1.0 SUMMARY

Advanced Environmental Consultants (AEC), Inc. has completed a *Limited Asbestos Inspection* of the Fire Station #20 located at 4445 Medgar Evers Blvd. in Jackson, Mississippi. AEC personnel inspected area of the building with hail damage for suspect Asbestos Containing Materials (ACM). The inspection includes the identification of representative material types and sample collections of suspect ACM. A description of the samples collected is provided in Table 1, along with the associated analytical results.

The *Limited Asbestos Inspection* indicated that **ACM was not detected** in those areas affected with hail damage.

The ceiling, flooring, piping, and roofing materials are homogeneous (areas similar in appearance and material composition) throughout the building.

This summary is provided solely for purposes of overview. Any party who relies on this report must read the entire report. The summary omits a number of details, any of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

AEC completed the *Limited Asbestos Inspection* at the above referenced building. Kristian King conducted the inspection on April 9, 2014. AEC Personnel, Kristian King, [a licensed State of Mississippi, Department of Environmental Quality Asbestos Inspector (Certificate No. ABI-00003739)] evaluated the building for suspect ACM and sampled all areas. Kristian King's license/certification is provided in Appendix A of this report.

3.0 SCOPE OF SERVICES AND LIMITATIONS

3.1 Scope of Services

A *Limited Asbestos Inspection* includes:

- 1) A visual reconnaissance of the interior affected areas and the roof to identify suspect ACM and sampling of these affected areas to identify and quantify the presence of asbestos located in the building materials;
- 2) Interior and exterior sketch of the sample locations of the building;
- 3) Photos of the areas where samples were collected;
- 4) The collection of two bulk samples from the ceiling, one bulk sample from the flooring, one bulk sample from piping material and six bulk samples from the roof;
- 5) An evaluation and documentation of the physical condition, location, and approximate quantity of suspect ACM at each sampling location;
- 6) The submission of bulk samples to a subcontracted analytical laboratory, under standard chain-of-custody procedures, certified by the U.S. Department of Commerce National Institute of Standards and Technology for Polarized Light Microscopy analysis, in general accordance with the National Institute for

Occupational Safety and Health (NIOSH) manual of analytical methods (40 CFR Part 763, *Methods for Determination of Asbestos in Bulk Samples*); and

- 7) An evaluation of the collected information and the preparation of this report, which includes our findings and conclusions.

3.2 Limitations and Warranty

AEC warrants that the results in this report are valid only for those materials and sample locations tested and analyzed, as a result of the inspection conducted on April 9, 2014.

4.0 DESCRIPTION OF SUBJECT PROPERTY

4.1 Setting and Location

Fire Station #20 is located at 4445 Medgar Evers Blvd. in Jackson, Mississippi. The samples were collected from the interior affected areas and the roof of the building reference above.

5.0 ASBESTOS IDENTIFICATION SURVEY

5.1 Description of Sampled Areas

The *Limited Asbestos Inspection* consisted of an evaluation of the building, as earlier indicated. The inspection included those areas in which access was provided and did not include areas to which access would have required damaging building components such as hard enclosures, areas that are/or could be defined as "confined spaces", and/or areas where access would cause undue risk to surveying personnel and/or occupants. Samples were collected from the wall, the ceiling, and the roof of the building. A description of the samples collected is provided in Table 1 (page 3).

5.2 Sampling Methodology

The following samples were collected for suspect ACM from the interior and exterior of the building:

- Two bulk samples from the ceiling
- One bulk sample from the flooring
- One bulk sample from the piping, and
- Six bulk samples from roofing materials.

5.3 Sampling Locations

A total of fifteen suspect ACM samples were collected from the wall, ceiling, flooring and roof of the building, as indicated in Table 1. The suspect bulk material samples were submitted for analysis on March 7, 2014 to SanAir Technologies Laboratory, Inc. (SATL) in Powhatan, Virginia. The surveyed areas were evaluated for friable, potentially friable, and non-friable ACM in miscellaneous materials in the building which may potentially contain asbestos. Representative samples were collected from each unique homogenous area suspected of containing asbestos.

The location of the samples, asbestos content, and observed physical condition are shown in Table 1.

5.4 Sample Handling and Analysis

The collected samples were stored in properly labeled and hermetically sealed containers for

analysis at SATL. Analysis was performed to determine the presence and type (if any) of ACM in the samples. Laboratory analysis utilized Polarized Light Microscopy (PLM) with dispersion staining in accordance with the NIOSH Manual of Analytical Methods, Third Edition, USEPA 40 CFR Part 763, entitled *Methods for Determination of Asbestos in Bulk Samples*. Collection, analysis, and disposition followed standard Chain-of-Custody (COC) requirements.

A copy of the laboratory analytical results and chain-of-custody forms are provided in Appendix B of this report. Table 1 shown below summarizes the analytical results obtained from SATL.

5.5 Asbestos Analytical Results

Based on the results of the inspection and a review of the analytical results, **ACM was not detected** in the areas inspected by AEC personnel.

TABLE 1

ASBESTOS IDENTIFICATION INSPECTION					
Sample	Sample Description	Sample Location	Asbestos Content	Friability	Physical Condition
AS-01	Sheetrock Ceiling	Captain's Quarter's Bathroom	NAD ¹	Non-Friable	Poor
AS-02	Ceiling Tile	Front Entrance	NAD	Friable	Poor
AS-03	Flashing	Roof	NAD	Non-Friable	Poor
AS-04	Floor Tile	Utility Room	NAD	Non-Friable	Poor
AS-05	TSI/Pipe	Engine Room	NAD	Friable	Poor
AS-06	Mastic	Perimeter of Roof	NAD	Non-Friable	Poor
AS-07	Roofing Material	Roof	NAD	Non-Friable	Poor
AS-08	Mastic/Outer Vent	Roof	NAD	Non-Friable	Poor
AS-09	Mastic/Middle Vent	Roof	NAD	Non-Friable	Poor
AS-10	Mastic/Flashing	Roof	NAD	Non-Friable	Poor

¹NAD = No Asbestos Detected

6.0 FINDINGS AND CONCLUSIONS

AEC concludes that based on the laboratory analysis **ACM was not detected** in the areas of the building AEC personnel inspected.

7.0 RECOMMENDATIONS

AEC has no further recommendations.

8.0 GENERAL COMMENTS

This report is an instrument of service prepared for the exclusive use of The Jones Group, and may not be reproduced or distributed without written authorization from said party. The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. The services were performed consistent with the agreement between AEC and The Jones Group. This report is solely

for the use and information of the Jones Group or as otherwise noted. Any unauthorized use of this report is strictly prohibited and AEC assumes no liability for any such use.

A hazardous substance includes any material that the USEPA has designated for special considerations under the Toxic Substances Control Act, Clean Air Act, and Clean Water Act, as defined under Section 101 (14) of CERCLA, as well as any hazardous waste defined under RCRA or constituents of petroleum products.

This report has been prepared in order to aid in the evaluation of the environmental contaminants, with regard to the potential for ACM present at the time of this study. The conclusions presented in this report were based on available information pertaining to various points in time and were presented by others for use by AEC or were based on informal discussion with various agency personnel. We do not warrant the accuracy of information supplied by others.

The conclusions in this report may rely on others credibility and therefore, any alteration in documentation or verbal information obtained may result in the redirection of the conclusions presented. Opinions presented herein may be based on test results performed by others and therefore, we are not responsible for variations in test results or inaccuracies resulting from laboratory testing provided by subcontracted testing laboratories.

FIGURES

FIGURE 1
INTERIOR OF BUILDING

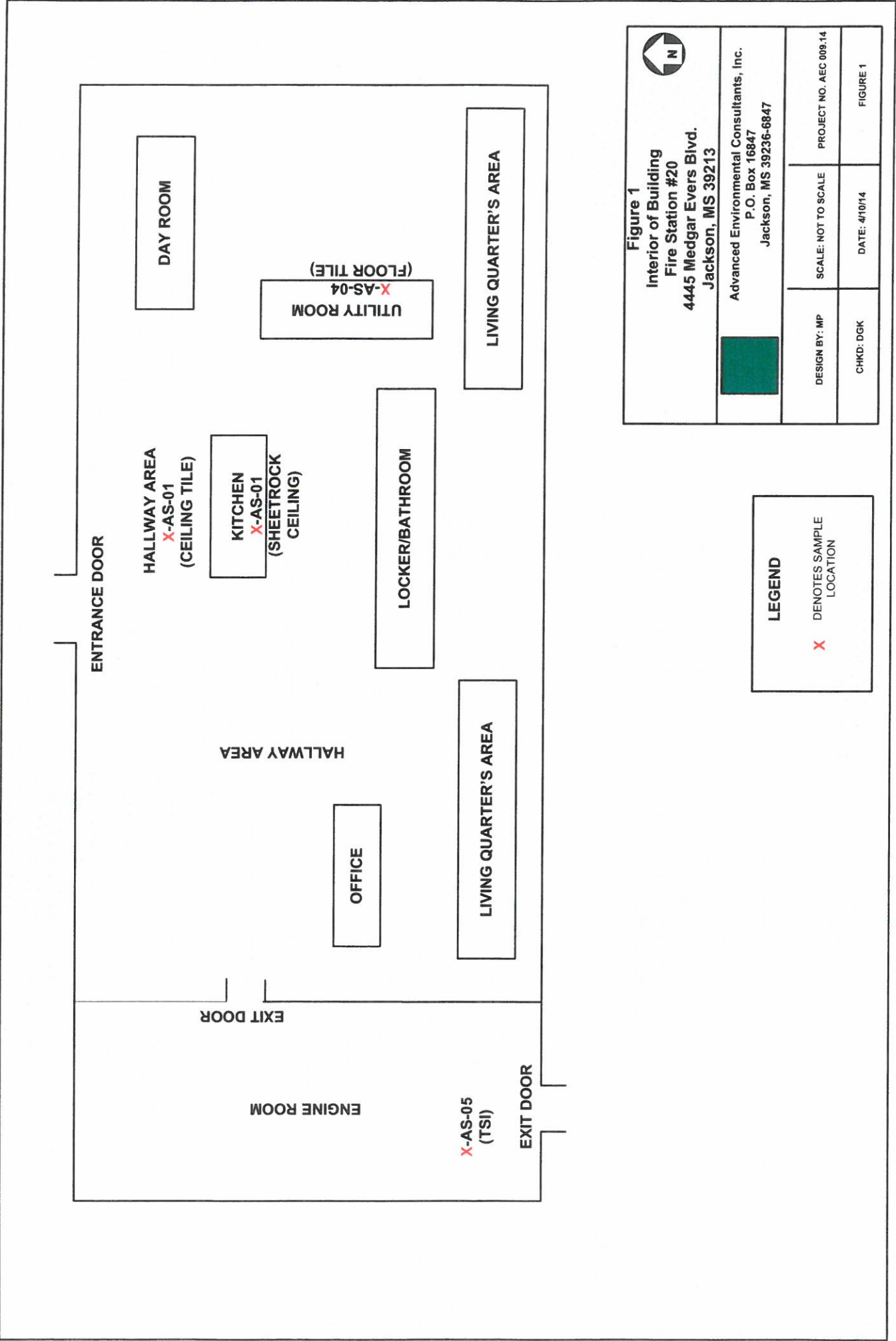


Figure 1
Interior of Building
Fire Station #20
4445 Medgar Evers Blvd.
Jackson, MS 39213





Advanced Environmental Consultants, Inc.
P.O. Box 16847
Jackson, MS 39236-6847

DESIGN BY: MP	SCALE: NOT TO SCALE	PROJECT NO. AEC 009.14
CHKD: DGK	DATE: 4/10/14	FIGURE 1

LEGEND

X DENOTES SAMPLE LOCATION

FIGURE 2

ROOF

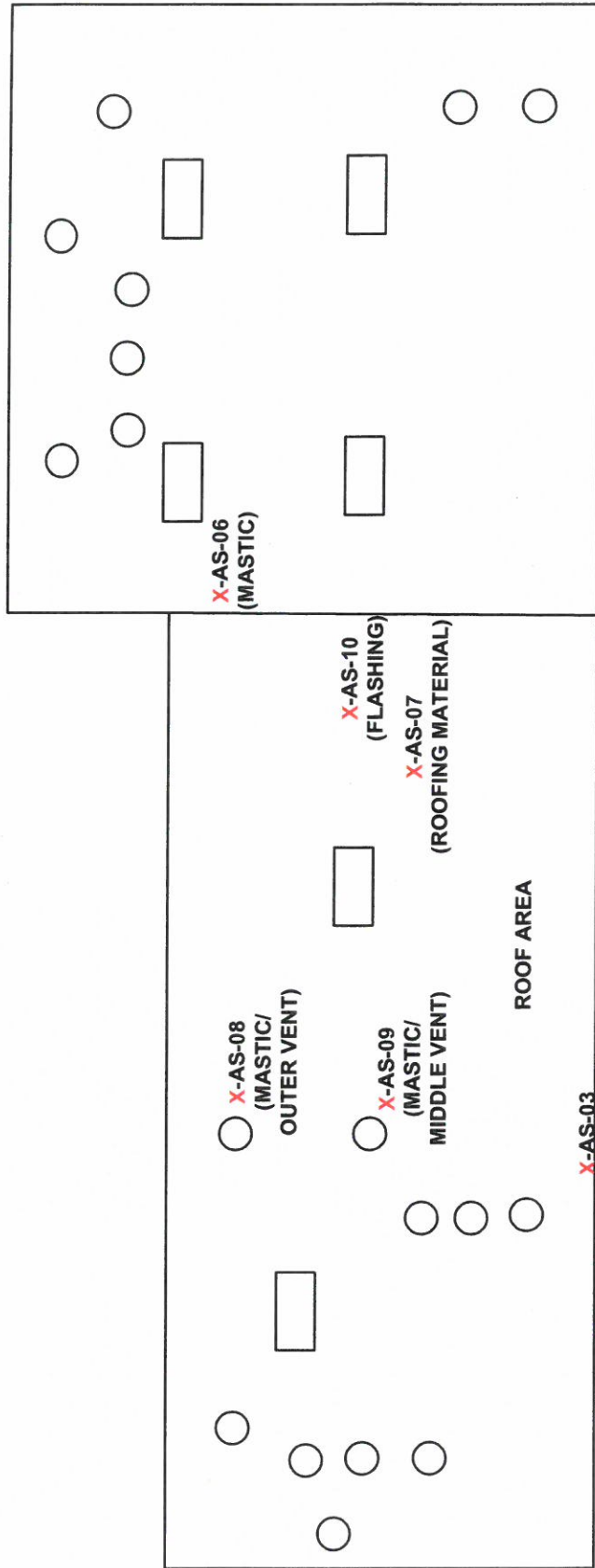
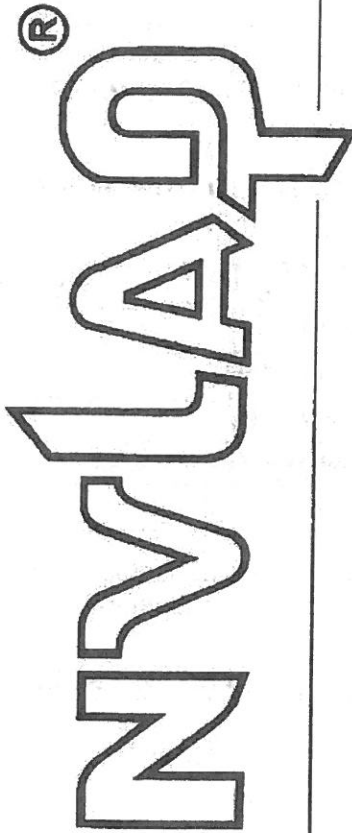


Figure 2 Roof Fire Station #20 4445 Medgar Evers Blvd. Jackson, MS 39213			Advanced Environmental Consultants, Inc. P.O. Box 16847 Jackson, MS 39236-6847		PROJECT NO. AEC 009.14
DESIGN BY: MP		SCALE: NOT TO SCALE		DATE: 4/10/14	
CHKD: DGK		FIGURE 1			

APPENDICES

APPENDIX A
CERTIFICATIONS AND LICENSES

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200870-0

SanAir Technologies Laboratory, Inc.
Powhatan, VA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

AIRBORNE ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2014-04-01 through 2015-03-31

Effective dates



W. D. M. L. D.

For the National Institute of Standards and Technology

State of Mississippi

*Department of Environmental Quality
Office of Pollution Control*

Certificate of Licensure

In accordance with the Asbestos Abatement Accreditation and Certification Act,
Enacted as 1989 Mississippi Law, Chapter 505

Be it known that

Kristian Shari King

Having submitted acceptable evidence of qualifications and
training and other appropriate information, is hereby granted this

***Asbestos Inspector
Certification***



Chief, Asbestos & Lead Certification Branch

*Certificate No.: ABI-00003739
Expiration Date: Jun 11th, 2014
Training Expires on Jun 11th, 2014*

55540 LIC20130001

APPENDIX B

ASBESTOS ANALYTICAL RESULTS CHAIN OF CUSTODY FORMS

SanAir Technologies Laboratory

Analysis Report

prepared for

**Advanced Environmental
Consultants, Inc**

Report Date: 4/11/2014
Project Name: Fire Station #20 INS
#035
Project #: AEC 009.14
SanAir ID#: 14008735



NVLAP LAB CODE 200870-0



Certification # 652931



License # LAB0166



804.897.1177

www.sanair.com



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

Advanced Environmental Consultants, Inc
PO Box 16847
Jackson, MS 39236

April 11, 2014

SanAir ID # 14008735
Project Name: Fire Station #20 INS #035
Project Number: AEC 009.14

Dear Kristian King,

We at SanAir would like to thank you for the work you recently submitted. The 10 sample(s) were received on Thursday, April 10, 2014 via FedEx. The final report(s) is enclosed for the following sample(s): AS-01, AS-02, AS-03, AS-04, AS-05, AS-06, AS-07, AS-08, AS-09, AS-10.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:

10 sample(s) in Good condition



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

SanAir ID Number

14008735

FINAL REPORT

Name: Advanced Environmental Consultants, Inc
Address: PO Box 16847
Jackson, MS 39236

Project Number: AEC 009.14
P.O. Number:
Project Name: Fire Station #20 INS #035

Collected Date: 4/9/2014
Received Date: 4/10/2014 10:35:00 AM
Report Date: 4/11/2014 10:23:57 AM
Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic Appearance	Components		Asbestos Fibers
		% Fibrous	% Non-Fibrous	
AS-01 / 14008735-001 Sheetrock Ceiling/ Kitchen	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
AS-02 / 14008735-002 Ceiling Tile/ Front Entrance	White Fibrous Homogeneous	60% Cellulose 15% Glass 15% Min. Wool	10% Other	None Detected
AS-03 / 14008735-003 Flashing/ Perimeter Of The Roof	Silver Non-Fibrous Homogeneous		100% Other	None Detected
AS-04 / 14008735-004 Floor Tile/ Utility Room	Brown Non-Fibrous Homogeneous		100% Other	None Detected
AS-05 / 14008735-005 TSI/ Pipe/ Engine Room	White Fibrous Homogeneous	40% Cellulose 50% Glass	10% Other	None Detected
AS-06 / 14008735-006 Mastic/ Perimeter Of The Roof	Black Non-Fibrous Homogeneous		100% Other	None Detected
AS-07 / 14008735-007 Roofing Material	Black Non-Fibrous Homogeneous		100% Other	None Detected

Certification

Signature: 
Date: 4/11/2014

Reviewed: 
Date: 4/11/2014



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

SanAir ID Number

14008735

FINAL REPORT

Name: Advanced Environmental Consultants, Inc
Address: PO Box 16847
Jackson, MS 39236

Project Number: AEC 009.14
P.O. Number:
Project Name: Fire Station #20 INS #035

Collected Date: 4/9/2014
Received Date: 4/10/2014 10:35:00 AM
Report Date: 4/11/2014 10:23:57 AM
Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic Appearance	Components		Asbestos Fibers
		% Fibrous	% Non-Fibrous	
AS-08 / 14008735-008 Mastic/ Outer Vent	Black Non-Fibrous Homogeneous		100% Other	None Detected

SanAir ID / Description	Stereoscopic Appearance	Components		Asbestos Fibers
		% Fibrous	% Non-Fibrous	
AS-09 / 14008735-009 Mastic/ Middle Vent	Black Non-Fibrous Homogeneous		100% Other	None Detected

SanAir ID / Description	Stereoscopic Appearance	Components		Asbestos Fibers
		% Fibrous	% Non-Fibrous	
AS-10 / 14008735-010 Mastic/ Flashing	Black Non-Fibrous Homogeneous		100% Other	None Detected

Certification

Signature: 

Date: 4/11/2014

Reviewed: 

Date: 4/11/2014

Page 2 of 2

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B - Powhatan, VA 23139

804.897.1177 / 888.895.1177 / Fax 804.897.0070

www.sanair.com

Asbestos Chain of Custody

SanAir ID Number

14008735

Company: Advanced Environmental Consultants, Inc.	Project #: AEC 009.14	Phone #: 601/362-1788
Address: 5450 Executive Place, Suite 2A	Project Name: Fire Station #20 INS #035	Phone #:
City, St., Zip: Jackson, MS, 39206	Date Collected: 4/9/14	Fax #: 601/362-3967
Samples Collected By: Kristian King	P.O. Number:	Email: aecinc@advancedenviroconsultants.com

Asbestos Analysis Types

Bulk		Air		Soil/Vermiculite	
ABB	PLM EPA 600/R-93/116	☒	ABA	PCM NIOSH 7400	☐
	Positive Stop	☐	ABA-2	OSHA w/ TWA*	☐
ABEPA	PLM EPA 400 Point Count	☐	ABTEM	TEM AHERA	☐
ABB1K	PLM EPA 1000 Point Count	☐	ABATN	TEM NIOSH 7402	☐
ABBEN	PLM EPA NOB	☐	ABT2	TEM Level II	☐
ABBCH	TEM Chatfield	☐			
ABBTM	TEM EPA NOB	☐			
ABBNY	TEM NY ELAP 198.4	☐			
OTHER/ Matrix :		☐			

Water		Dust			
ABHE	EPA 100.2	☐	ABWA	TEM Wipe ASTM D-6480	☐
			ABDMV	TEM Microvac ASTM D-5755	☐

Turn Around Times	☐ 3 HR (4 HR TEM)	☐ 6 HR (8HR TEM)	☐ 12 HR	☒ 24 HR
	2 Days ☐	3 Days ☐	4 Days ☐	5 Days ☐

Sample #	Sample Identification/Location	Volume or Area	Sample Type	Flow Rate*	Time* Start - Stop
AS-01	Sheetrock Ceiling/ Kitchen		ABB		
AS-02	Ceiling Tile/ Front Entrance		ABB		
AS-03	Flashing/ Perimeter of the Roof		ABB		
AS-04	Floor Tile/ Utility Room		ABB		
AS-05	TSI/ Pipe/ Engine Room		ABB		
AS-06	Mastic/ Perimeter of the Roof		ABB		
AS-07	Roofing Material		ABB		
AS-08	Mastic/ Outer Vent		ABB		
AS-09	Mastic/ Middle Vent		ABB		
AS-10	Mastic/ Flashing		ABB		

Special Instructions

Relinquished by	Date	Time	Received by	Date	Time
<i>Kristian King</i>	4/9/14	5:00 pm	<i>MC</i>	10/20/14	10:35 AM

Unless scheduled, the turn around time for all samples received after 5 pm Friday will begin at 8 am Monday morning.
Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time.
Work with standard turn around time sent Priority Overnight and Billed To Recipient will be charged a \$10 shipping fee.

Disclaimer

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

NY ELAP lab ID 11983

APPENDIX C
SITE PHOTOGRAPHS

SITE PHOTOGRAPHS

Limited Asbestos Inspection
Fire Station #20
4445 Medgar Evers Blvd.
Jackson, MS 39213

AEC 009.14



Sheetrock Ceiling/Kitchen (AS-01)



Ceiling Tile/Front Entrance (AS-02)



Flashing/Perimeter of the Roof (AS-03)



Floor Tile/Utility Room (AS-04)



TSI/Pipe/Engine Room (AS-05)



Mastic/Perimeter of the Roof (AS-06)



Roofing Material (AS-07)



Mastic/Outer Vent (AS-08)



Mastic/Middle Vent (AS-09)



Mastic/Flashing (AS-10)



Advanced Environmental Consultants, Inc.
Project Managers and Scientists

Asbestos Survey



**Fire Station No. 20
4445 Medgar Evers Boulevard
Jackson, MS 39213**

Prepared for:

**City of Jackson
P. O. Box 17
Jackson, MS 39201**

Prepared by:

**Advanced Environmental Consultants, Inc.
775 North President Street
Jackson, MS 39202**

Project AEC 077.17

September 7, 2017

**P. O. Box 16847
Jackson, MS 39236-6847**

**Phone: (601) 362-1788 Fax: (601) 362-3967 Email: aecinc@advancedenviroconsultants.com
www.advancedenviroconsultants.com**

**775 North President Street
Jackson, MS 39202**

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 SUMMARY	1
2.0 INTRODUCTION.....	1
3.0 SCOPE OF SERVICES AND LIMITATIONS	1
3.1 SCOPE OF SERVICES.....	1
3.2 LIMITATIONS AND WARRANTY	2
4.0 ASBESTOS IDENTIFICATION INSPECTION	2
4.1 DESCRIPTION OF SAMPLED AREAS	2
4.2 SAMPLING METHODOLOGY	3
4.3 SAMPLE HANDLING AND ANALYSIS.....	3
4.4 ASBESTOS ANALYTICAL RESULTS	3
5.0 FINDINGS AND CONCLUSIONS.....	3
6.0 RECOMMENDATIONS	3
7.0 GENERAL COMMENTS	4

APPENDICES

APPENDIX A	CERTIFICATION AND LICENSES
APPENDIX B	ASBESTOS ANALYTICAL RESULTS
	CHAIN-OF-CUSTODY FORMS
APPENDIX C	SITE PHOTOGRAPHS

ASBESTOS SURVEY

1.0 SUMMARY

Advanced Environmental Consultants, Inc. (AEC) has completed an *Asbestos Survey* of Fire Station No. 20 located at 4445 Medgar Eves Boulevard in Jackson, Mississippi. The building was surveyed following the guidelines of the National Emissions Standards for Hazardous Air Pollutants (NESHAPS). Table 1 provides information regarding building owner, address of site, laboratory utilized, inspector, and areas inspected. AEC inspected the building for suspect Asbestos Containing Materials (ACM). A description of the samples collected and the analytical results are provided in Tables 2 and 4, respectively.

Table 1. General Information

Client	City of Jackson		
Address	Fire Station No. 20 4445 Medgar Eves Boulevard Jackson, MS 39213	Date of Inspection	9/5/17
Analytical Laboratory	SanAir Technologies Laboratory, Inc.		
Inspector	Michael Peavy (MDEQ Inspector Certificate No. ABI-00005099) ¹		
Inspected Areas	Inspected the interior and exterior areas of the building for suspect ACM.		

¹See appendix A for copies of licenses/certifications

The *Asbestos Survey* indicated that ACM **was not detected** in levels greater than one percent chrysotile in the sampled area.

This summary is provided solely for purposes of overview. Any party who relies on this report must read the entire report. The summary omits a number of details, any of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

The inspector evaluated the interior and exterior areas of the building for suspect ACM and sampled all areas identified. Copies of licenses/certifications for the inspector and the analytical laboratory are provided in Appendix A of this report.

3.0 SCOPE OF SERVICES AND LIMITATIONS

3.1 Scope of Services

An *Asbestos Survey* includes:

- 1) A visual reconnaissance of the area to identify suspect ACM and sampling of the subject property to identify and quantify the presence of asbestos located in the building materials;

- 2) The collection of representative samples and suspect ACM within each homogeneous area (areas similar in appearance, material composition, and date of application);
- 3) An evaluation and documentation of the physical condition, location, and approximate quantity of suspect ACM at each sampling location;
- 4) The submission of bulk samples to a subcontracted analytical laboratory, under standard chain-of-custody procedures, certified by the U.S. Department of Commerce National Institute of Standards and Technology for Polarized Light Microscopy analysis, in general accordance with the National Institute for Occupational Safety and Health (NIOSH) manual of analytical methods (40 CFR Part 763, *Methods for Determination of Asbestos in Bulk Samples*); and
- 5) An evaluation of the collected information and the preparation of this report, which includes our findings and conclusions.

3.2 Limitations and Warranty

AEC warrants that the results in this report are valid only for those materials and sample locations tested and analyzed, as a result of the Survey conducted on September 5, 2017.

4.0 ASBESTOS IDENTIFICATION INSPECTION

4.1 Description of Sampled Areas

The *Asbestos Survey* consisted of an evaluation of the building, as earlier indicated. The Survey included those areas in which access was provided. The survey of the building for asbestos containing materials identified suspect asbestos containing material at one location. A description of the sample location is provided in Table 2.

Table 2. Sample Locations

Sample	Sample Description	Sample Location	Asbestos Content	Friability	Physical Condition
AS-01	Sheetrock Wall	Near Front Entrance Door	NAD ¹	Non-Friable	Fair

NAD means No Asbestos Detected

Note: According to 40 CFR 61 (NESHAPS) Asbestos Containing Material (ACM) is any material that contains more than one percent of asbestos.

4.2 Sampling Methodology

Professional judgment was utilized in selecting the sampling locations and in determining the number of bulk samples to be collected. These samples were treated as homogeneous and representative of like materials throughout the building. Details are shown in Table 3.

4.3 Sample Handling and Analysis

The collected samples were stored in properly labeled and hermetically sealed containers for analysis at the laboratory specified on Table 3. Analysis was performed to determine the presence and type (if any) of ACM in the samples.

Laboratory analysis utilized Polarized Light Microscopy (PLM) with dispersion staining in accordance with the NIOSH Manual of Analytical Methods, Third Edition, and USEPA 40 CFR Part 763, entitled *Methods for Determination of Asbestos in Bulk Samples*. Collection, analysis, and disposition followed standard Chain-of-Custody (COC) requirements.

Table 3. Details of Sampling Methodology

Number of samples collected	1
Number of samples analyzed (including composed samples)	1
Date sample(s) submitted for analysis	9/5/17
Analytical Laboratory	SanAir Technologies Laboratory, Inc. ¹ Powhatan, Virginia

¹See Appendix A for copies of the required licenses

4.4 Asbestos Analytical Results

A copy of the laboratory analytical results and chain-of-custody forms are provided in Appendix B of this report. Based on the results of the *Asbestos Survey*, ACM **was not detected** in the area sampled at Fire Station Number 20 located at 4445 Medgar Evers Boulevard, Jackson, MS 39213.

5.0 FINDINGS AND CONCLUSIONS

The *Asbestos Survey* indicated that ACM **was not detected** in levels greater than one chrysotile at Fire Station No. 20 located at 4445 Medgar Evers Boulevard, Jackson, MS 39213.

6.0 RECOMMENDATIONS

AEC has no further recommendations.

7.0 GENERAL COMMENTS

This report is an instrument of service prepared for the exclusive use of the City of Jackson as referenced in Table 1, and may not be reproduced or distributed without written authorization from said party. The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. The services were performed consistent with the agreement between AEC and the City of Jackson. This report is solely for the use and information of the City of Jackson or as otherwise noted. Any unauthorized use of this report is strictly prohibited and AEC assumes no liability for any such use.

A hazardous substance includes any material that the USEPA has designated for special considerations under the Toxic Substances Control Act, Clean Air Act, and Clean Water Act, as defined under Section 101 (14) of CERCLA, as well as any hazardous waste defined under RCRA or constituents of petroleum products.

This report has been prepared in order to aid in the evaluation of Fire Station No. 20 located at 4445 Medgar Evers Boulevard, in Jackson, Mississippi, with regard to the potential for ACM present at the time of this study. The conclusions presented in this report were based on available information pertaining to various points in time and were presented by others for use by AEC or were based on informal discussion with various agency personnel. We do not warrant the accuracy of information supplied by others.

The conclusions in this report may rely on others credibility and therefore, any alteration in documentation or verbal information obtained may result in the redirection of the conclusions presented. Opinions presented herein may be based on test results performed by others and therefore, we are not responsible for variations in test results or inaccuracies resulting from laboratory testing provided by subcontracted testing laboratory.

APPENDICES

APPENDIX A

CERTIFICATIONS AND LICENSES

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive

Suite B

Powhatan, VA 23139

Ms. Sandra Sobrino

Phone: 804-897-1177 Fax: 804-897-0070

Email: ssobrino@sanair.com

<http://www.sanair.com>

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 200870-0

Bulk Asbestos Analysis

Code

Description

18/A01

EPA -- Appendix E to Subpart E of Part 763 -- Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

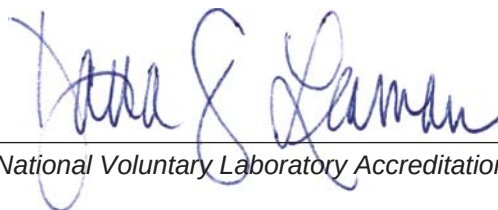
Airborne Asbestos Analysis

Code

Description

18/A02

U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.



For the National Voluntary Laboratory Accreditation Program

State of Mississippi

*Department of Environmental Quality
Office of Pollution Control*

Certificate of Licensure

In accordance with the Asbestos Abatement Accreditation and Certification Act,
Enacted as 1989 Mississippi Law, Chapter 505

Be it known that

Michael Peavy

Having submitted acceptable evidence of qualifications and
training and other appropriate information, is hereby granted this

*Asbestos Inspector
Certification*



*Certificate No.: ABI-00005099
Expiration Date: Jul 12th, 2018
Training Expires on Jul 12th, 2018*

Chief, Asbestos & Lead Certification Branch

58455 LIC20170003

APPENDIX B

ASBESTOS ANALYTICAL RESULTS
CHAIN OF CUSTODY FORMS

SanAir Technologies Laboratory

Analysis Report

prepared for

**Advanced Environmental
Consultants, Inc**

Report Date: 9/7/2017
Project Name: Fire Station 20
Jackson, MS
Project #: AEC 077.17
SanAir ID#: 17034973



NVLAP LAB CODE 200870-0



Certification # 652931



License # LAB0166



804.897.1177

www.sanair.com



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

Advanced Environmental Consultants, Inc
775 North President Street
Jackson, MS 39202

September 7, 2017

SanAir ID # 17034973
Project Name: Fire Station 20 Jackson, MS
Project Number: AEC 077.17

Dear Michael Peavy,

We at SanAir would like to thank you for the work you recently submitted. The 1 sample(s) were received on Wednesday, September 06, 2017 via FedEx. The final report(s) is enclosed for the following sample(s): AS-01.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:

1 sample(s) in Good condition



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

SanAir ID Number

17034973

FINAL REPORT

Name: Advanced Environmental Consultants, Inc
Address: 775 North President Street
Jackson, MS 39202

Project Number: AEC 077.17
P.O. Number:
Project Name: Fire Station 20 Jackson, MS

Collected Date: 9/5/2017
Received Date: 9/6/2017 10:40:00 AM
Report Date: 9/7/2017 10:09:37 AM
Analyst: Toth, Elizabeth

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic Appearance	Components		Asbestos Fibers
		% Fibrous	% Non-Fibrous	
AS-01 / 17034973-001 Sheetrock Wall/ Near Front Entrance Door	Off-White Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Certification

Analyst: *Elizabeth Toth*
Analysis Date: 9/7/2017

Approved Signatory: *Sandra Sobrin*
Date: 9/7/2017



1551 Oakbridge Drive Suite B
Powhatan, VA 23139
804-897-1177 / 888-895-1177
Fax 804-897-0070
www.sanair.com

Asbestos Chain of Custody

SanAir ID Number

17034973

Company: Advanced Environmental Consultants, Inc.		Project #: AEC 077.17	Collected by: Michael Peavy
Address: 775 N President Street		Project Name: Fire Station #20 Jackson, MS	Phone #: 601-362-1788
City, St., Zip: Jackson, MS 39202		Date Collected: 9/5/17	Fax #: 601-362-3967
State of Collection: MS Account#: 1871		P.O. Number:	Email: aecinc@advancedenviroconsultants.com

Bulk			Air			Soil/Vermiculite		
ABB	PLM EPA 600/R-93/116	☒	ABA	PCM NIOSH 7400	☐	ABSE	PLM EPA 600/R-93/116 (Qual.)	☐
	Positive Stop	☐	ABA-2	OSHA w/ TWA*	☐	ABSP	PLM CARB 435 (LOD <1%)	☐
ABEPA	PLM EPA 400 Point Count	☐	ABTEM	TEM AHERA	☐	ABSP1	PLM CARB 435 (LOD 0.25%)	☐
ABB1K	PLM EPA 1000 Point Count	☐	ABATN	TEM NIOSH 7402	☐	ABSP2	PLM CARB 435 (LOD 0.1%)	☐
ABBEN	PLM EPA NOB	☐	ABT2	TEM Level II	☐			
ABBCH	TEM Chatfield	☐						
ABBTM	TEM EPA NOB	☐						

Water			New York ELAP			Dust		
ABHE	EPA 100.2	☐	PLM NY	PLM EPA 600/M4-82-020	☐	ABWA	TEM Wipe ASTM D-6480	☐
			ABEPA2	NY ELAP 198.1	☐	ABDMV	TEM Microvac ASTM D-5755	☐
			ABENY	NY ELAP 198.6 PLM NOB	☐	Matrix Other		
			ABBNY	NY ELAP 198.4 TEM NOB	☐			☐

Turn Around Times	3 HR (4 HR TEM) ☐	6 HR (8HR TEM) ☐	12 HR ☐	24 HR ☒
	2 Days ☐	3 Days ☐	4 Days ☐	5 Days ☐

Special Instructions

Sample #	Sample Identification/Location	Volume or Area	Sample Type	Flow Rate*	Time* Start - Stop
AS-01	Sheetrock Wall/Near Front Entrance Door		ABB		

Relinquished by	Date	Time	Received by	Date	Time
Michael Peavy	9/5/17	9:19 AM	MC	SEP 06 2017	10:40 AM

Unless scheduled, the turn around time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time. Work with standard turn around time sent Priority Overnight and Billed to Recipient will be charged a \$10 shipping fee. 1 of 1

Disclaimer

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

NY ELAP lab ID 11983

APPENDIX C
SITE PHOTOGRAPHS

SITE PHOTOGRAPHS

Asbestos Survey

Fire Station No. 20
4445 Medgar Evers Boulevard
Jackson, MS 39213



SECTION 00413**PROPOSAL FORM**

To: CITY OF JACKSON CITY COUNCIL
OFFICE OF THE CITY CLERK
CITY OF JACKSON CITY HALL
219 SOUTH PRESIDENT STREET
JACKSON, MS 39201

Project Title: City of Jackson
Fire Station 20
4445 Medgar Evers
Jackson, MS
CCD No. 16004

Location: JACKSON, MISSISSIPPI

Ladies and Gentlemen:

Having carefully examined all conditions of the Contract and all Amendments, Supplements and Addenda thereto, having visited the site and being familiar with the conditions thereof, I or We propose to furnish all labor, materials and equipment to complete all work required by the Contract Documents entitled Fire Station #20, City of Jackson, 4445 Medgar Evers Blvd, Jackson, Mississippi dated January 15, 2018, (Project Manual Revised January 29, 2020) as prepared by Canizaro Cawthon Davis, for the lump sum amount set forth below:

BASE BID:

_____ Dollars (\$_____)

The project shall be completed by five hundred and forty (540) days after the Notice to Proceed.

DEDUCT ALTERNATE NO. ONE (1) BID:

_____ Dollars (\$_____)

DEDUCT ALTERNATE NO. TWO (2) BID:

_____ Dollars (\$_____)

DEDUCT ALTERNATE NO. THREE (3) BID:

_____ Dollars (\$_____)

DEDUCT ALTERNATE NO. FOUR (4) BID:

_____ Dollars (\$_____)

DEDUCT ALTERNATE NO. FIVE (5) BID:

_____ Dollars (\$_____)

DEDUCT ALTERNATE NO. SIX (6) BID:

_____ Dollars (\$_____)

LIQUIDATED DAMAGES:

The stipulated liquidated damages described in Paragraph 9.11 of the Section 00731 - Supplementary Conditions are in the amount of Five Hundred Dollars (\$500.00) per calendar day.

I am authorized to enter my firm into a binding contract if this proposal is accepted.

Respectfully submitted,

Contractor / Firm: _____

Name & Title: _____

By: _____ Date: _____

Certificate of
Responsibility No. _____

I, or We, agree to hold our bid open for acceptance for sixty (60) calendar days from the date of opening of bids.

Enclosed herewith is Bid Bond or Certified Check in an amount equal to five percent (5%) of the Base Bid, guaranteeing the Owner the execution of the Performance and Payment Bonds and the Contract.

I, or We, acknowledge receipt of the following Addenda:

Addendum No. One (1), dated _____

Addendum No. Two (2), dated _____

Addendum No. Three (3), dated _____

Addendum No. Four (4), dated _____

Addendum No. Five (5), dated _____

Addendum No. Six (6), dated _____

Addendum No. Seven (7), dated _____

Addendum No. Eight (8), dated _____

TO BE FILLED IN IF A CORPORATION

Date: _____

_____ (Company Name)

Our Corporation is chartered under the laws of the State of _____
_____, and the names, titles and business addresses of the executives are as follows:

President	Address

Secretary	Address

Treasurer	Address

TO BE FILLED IN IF A LIMITED LIABILITY CORPORATION (LLC)

Date: _____

_____ (Company Name)

Our Corporation is chartered under the laws of the State of _____
_____, and the names, titles and business addresses of the executives are as follows:

President	Address

Secretary	Address

Treasurer	Address

TO BE FILLED IN IF A PARTNERSHIP

Date: _____

Name	Address

Name	Address

Name	Address

TO BE FILLED IN IF A SOLE PROPRIETORSHIP:

Date: _____

_____ (Company Name)

Name	Address

SUBCONTRACTOR LIST:

Mechanical (HVAC): _____

Mechanical (Plumbing): _____

Electrical: _____

Bidder certifies that he is a:

_____ Resident Contractor

_____ Non-Resident Contractor

Sealed Bids will be received by the City Clerk of Jackson, Mississippi at 219 South President Street, Jackson MS 39201 or P.O. Box 17, Jackson, MS 39205.

Envelopes containing Bids, bid Bonds, etc., must be sealed and addressed as follows:

Office of the City Clerk
City of Jackson City Hall
219 South President Street
Jackson, Mississippi 39201

Provide Certificate of Responsibility on outside of envelope.

Bid Proposal for: Fire Station #20
City of Jackson
4445 Medgar Evers
Jackson, Mississippi

--END OF PROPOSAL--

SECTION 00524

STANDARD FORM OF AGREEMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Owner will use the Standard Form of Agreement between Owner and Contractor where the basis of payment is a Stipulated Sum, AIA Document A101, 2007 as a part of the Contract Documents.

PART 2 PRODUCTS Not Used

PART 1 EXECUTION Not Used

--END OF SECTION--

SECTION 00600

CONTRACT BONDS

PART 1 GENERAL

- 1.1 PERFORMANCE BOND: The Contractor shall provide an executed AIA Document A 312, 2010 Performance Bond as part of the Contract Documents.
- 1.2 PERFORMANCE BOND SUPPLEMENTS: The following supplements modify, change, delete from or add to the Performance Bond AIA Document A 312, 2010 and must be included in the executed document.
 - A. Paragraph 2: Add the phrases "all of its obligations of" after the word "performs" and "in accordance with the terms thereof" after the words "the Construction Contract".
- 1.3 PAYMENT BOND: The Contractor shall provide an executed AIA Document A 312, 2010 Payment Bond as part of the Contract Document. No modifications, changes or deletions are required for the Payment Bond.
- 1.4 STATE LAW: The above mentioned documents are construction industry standards but whenever a conflict arises between the documents and State of Mississippi Law, the State law governs.
- 1.5 POWER OF ATTORNEY: Each Bond must be accompanied by an appropriate Power of Attorney.

PART 2 PRODUCTS Not Used

PART 3 PRODUCTS Not Used

--END OF SECTION--

PART 1 GENERAL

- A. The *Certificate of Insurance* is a tabulation of insurance required for this Project as specified in Article 11 entitled *Insurance and Bonds* in the General Conditions (AIA Document A201, 2007 edition).
- B. The *Certificate of Insurance* must be completed, certified by the original signature of a Mississippi Resident Insurance Agency and bound in each set of the Contract Documents.
- C. Indicate Insured, Project, Companies providing coverage, policy numbers and policy periods in the blanks as applicable.
- D. If the "OWNERS / CONTRACTORS PROTECTIVE LIABILITY" insurance is part of the Commercial General Liability Insurance Policy, or included by endorsement, indicate the policy number and period of the CGL policy in the "OWNERS / CONTRACTORS PROTECTIVE LIABILITY" blank spaces.
- E. Automobile Liability Insurance may be provided which covers Bodily Injury and Property Damage in one (1) Combined Single Limit, or may be provided with separate minimum limits as shown on the Certificate of Insurance and specified in Article 11 of the Supplementary Conditions. The person signing the Certificate of Insurance should show which option the Contractor has selected by marking out the coverage that is not provided under the policies indicated.
- F. OTHER INSURANCE (if required) will be indicated by typing in the "OTHER" block and detailed in Article 11 of the Supplementary Conditions.
- G. CERTIFICATION wording may not be changed without specific written approval from the Owner.
- H. "Riders" or other unsolicited attachments are not allowed as part of the *Certificate of Insurance* unless specifically requested in writing by the Owner, or specified as part of the requirements for this Project.
- I. CAUTION: The *Certificate of Insurance* is intended to be used for all Projects. The Contractor must provide all insurance specified in the Contract Documents for this Project, whether indicated on this form, or not. The Contractor must verify all insurance has been provided as required.
- J. The Owner and Architect and all of their agents and employees are included as additional insureds on the Contractor's insurance.

PART 2 PRODUCTS Not Used

PART 3 PRODUCTS Not Used

STANDARD CONSTRUCTION CONTRACT CERTIFICATE OF INSURANCE

This certificate of insurance neither affirmatively nor negatively amends, extends, or alters the coverage afforded in the policies below.

INSURED: (Contractor's Name & Address) ADDITIONAL INSURED: (check to indicate coverage) Design Professional Canizaro Cawthon Davis _____ Owner _____				COMPANIES PROVIDING COVERAGE	
				A	
				B	
PROJECT: CCD Project No. 16004 Fire Station #20 4445 Medgar Evers Jackson, Mississippi				C	
				D	
OWNER: City of Jackson				E	
Type Insurance	Co	Policy Number	Policy Period	Coverage and Minimum Amount	
General Liability Commercial General Liability				General Aggregate	\$ 2,000,000
				Products Comp/Ops (Aggregate)	\$ 2,000,000
				Personal Injury (Per Occurrence)	\$ 1,000,000
				BI & PD (Per Occurrence)	\$ 1,000,000
				Fire Damage (Per Fire)	\$ 500,000
				Medical Expense (Per Person)	\$ 10,000
Owner's / Contractor's Protective Liability				General Aggregate	\$ 2,000,000
				Per Occurrence	\$ 1,000,000
Automobile Liability				Bodily Injury / Property Damage Combined Single Limit (Per Occurrence)	\$ 1,000,000
				Bodily Injury (Per Person)	\$ 500,000
				OR Bodily Injury (Per Accident)	\$ 1,000,000
				Property Damage (Per Occurrence)	\$ 100,000
*Excess Liability (Umbrella on projects over \$500,000)				Aggregate	\$ 2,000,000
				Per Occurrence	\$ 1,000,000
Workers' Compensation (As required by Statute) Employers' Liability				Accident (Per Occurrence)	\$ 100,000
				Disease-Policy Limit	\$ 500,000
				Disease-Per Employee	\$ 100,000
*Property Insurance				Builders' Risk	Must be equal to Value of Work
Other					
Certification: I certify that these policies (subject to their terms, conditions and exclusions) have been (1) issued to the Insured for the coverages and at least the amounts as indicated by companies licensed in Mississippi; (2) countersigned by a Mississippi Resident Agent; (3) endorsed to require the company to give thirty (30) days written notice to the Owner prior to cancellation of non-renewal of above.					
Producing Agent: (Name, Address and Telephone)				(Signature & Date)	
				(Name and Title of Authorized Representative)	

END OF SECTION

SECTION 00724**GENERAL CONDITIONS**

The General Conditions for this project shall be AIA Document A201, General Conditions of the Contract for Construction, 2007 Edition.

This document shall be made a part of the Contract Documents as if fully stated herein.

Contractors are presumed to be familiar with this document, however a copy may be examined in the Architect's office.

END OF SECTION

SECTION 00731

SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The following Supplementary Conditions modify the "General Conditions of the Contract for Construction," AIA Document A201, 2007. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect. In the event of a conflict between the General Conditions of the Contract for Construction, Section 00731 shall control even if the conflicting provision in the General Conditions of the Contract for Construction is not expressly revised or deleted by reference in Section 00731.
- B. The General Conditions may also be supplemented or amplified elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, Division 1 of the Specifications.

1.2 SUPPLEMENTS

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS:

Delete the last sentence in Article 1.1.1 and insert the following:

The Contract Documents shall include the Instructions to Bidders, the plans, the specifications, including Divisions 1 through 16, all Addenda and modifications to the plans and/or specifications, the Agreement between Owner and Contractor, the performance and payment bonds, the notice to proceed and any executed change orders. Information and documentation pertaining to soil investigation data, laboratory investigations, soil borings and related information included herein are not part of the Contract Documents. In the event of a conflict between the provisions of Division 0 and any other section of the Contract Documents, such other sections(s) shall govern.

1.1.2 THE CONTRACT

Add the following to the end of Article 1.1.2:

Large scale drawings shall govern over small scale drawings where there are differences or conflicts between such drawings. Where the word "similar" appears on the plans, it shall not be interpreted to mean "identical" and shall require the Contractor to coordinate the actual conditions and dimensions of the location where the "similar" conditions are shown to occur.

1.1.9 MISCELLANEOUS DEFINITIONS

Add the following:

The term "products" as used in these Supplementary Conditions includes materials, systems and equipment.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.4 Add the following Article 1.2.4:

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as necessary to produce the intended results.

1.2.5 Add the following Article 1.2.5:

The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the intent of the Contract Documents. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as "Not In Contract" ("N.I.C."), the Contractor's obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor's expense to produce a product or system that is complete, appropriately tested, and in operable condition ready for use or subsequent construction or operation by the Owner or separate contractors. The omission of words or phrases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Advertisement of Bids.

In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

Generally, portions of the Contract Documents written in longhand take precedence over typed portions, and typed portions take precedence over printed portions.

Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them, shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

1.6 TRANSMISSION OF DATA IN DIGITAL FORM

Delete the phrase “they shall endeavor to” in the second line and insert the phrase “the Architect shall” and add the following to the end of the sentence:

..., which protocols shall be the same as or similar to the Digital Data Protocol Exhibit, AIA Doc. E201-2007.”

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Add the following to the beginning of Article 2.2.1:

If the Project is a private project, not funded by public funds, then . . .

2.2.2 Delete Article 2.2.2 in its entirety.

2.2.3 Delete Article 2.2.3 in its entirety.

2.2.5 Delete Article 2.2.5 in its entirety and insert the following:

2.2.5 The Contractor will be furnished free of charge ten (10) printed copies of the plans and specifications, including all Addenda. Additional sets will be furnished at the cost of reproduction, postage and handling. In addition, the contractor will be provided one (1) electronic PDF copy of final contract documents for the use of the construction team.

2.3 OWNER’S RIGHT TO STOP THE WORK

2.3 Delete Article 2.3 in its entirety and insert the following:

2.3 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Article 12.2 or fails to carry out Work in accordance with the Contract Documents or fails to perform any of its obligations under the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated. However, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Article 6.1.3.

The rights and remedies under this Article 2.3 are in addition to and do not in any respect limit any other rights of the Owner, including its termination rights under Article 14.

ARTICLE 3 - CONTRACTOR

3.1 GENERAL

3.1.1 Add the following at the end of Article 3.1.1:

The relationship of Contractor to Owner shall be that of independent contractor, and nothing in the Contract Documents is intended to nor should it be construed as creating any other relationship, expressed or implied, between Owner and Contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.5 Add the following Article 3.2.5:

The Owner is entitled to deduct from the Contractor's pay applications for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

3.4 LABOR AND MATERIALS

3.4.2 Add the following to the end of Article 3.4.2:

Some Sections of the Specifications may not allow substitution of materials, products or equipment. Where substitution is allowed the request for substitution will only be considered if made in strict accordance with the requirements of Article 3.4.4 below and Section 01 63 00.

3.4.4 Add the following Article 3.4.4:

After the Contract has been executed, the Owner and the Architect may consider a request for the substitution of products in place of those specified only under the conditions set forth in Section 01 63 00 of the specifications.

By making requests for substitutions, the Contractor:

- .1 Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respect to that specified;
- .2 Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 Certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently becomes apparent; and
- .4 Shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects at its costs.

All substitutions shall be submitted within 30 days of the Notice to Proceed, as per Section 01630.

3.4.5 Add the following Article 3.4.5:

Contractor represents that it has independently investigated, considered and understands the labor conditions in the area surrounding the Project and acknowledges that such conditions may impact the Contractor's cost and/or time of performance of the Contract. Therefore, Contractor further represents that the Contract Price is based upon Contractor's independent investigations into such labor conditions and that the Contract time is reasonable and the date of Substantial Completion is obtainable. As a result, Contractor assumes the risk of increased costs, if any, incurred by it arising out of or related to such labor conditions and acknowledges that Contractor and its surety will reimburse Owner for any additional costs Owner incurs arising out of or related to such labor conditions.

3.4.6. Add the following Article 3.4.6:

E-Verification: Contractor represents and warrants that it will ensure its compliance with the Mississippi Employment Protection Act (Senate Bill 2988 from the 2008 Regular Legislative Session) and will register and participate in the status verification system for all newly hired employees. The term "employee" as used herein means any person that is hired to perform work within the State of Mississippi. As used herein, "status verification system" means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. Contractor agrees to maintain records of such compliance and, upon request of the State, to provide a copy of each such verification to the State. Contractor further represents and warrants that any person assigned to perform services hereunder meets the employment eligibility requirements of all immigration laws of the State of Mississippi. Contractor understands and agrees that any breach of these warranties may subject Contractor to the following: (a) termination of this Agreement and ineligibility for any state or public contract in Mississippi for up to three (3) years with notice of such cancellation/termination being made public, or (b) the loss of any license, permit, certification or other document granted to Contractor by an agency, department or governmental entity for the right to do business in Mississippi for up to one (1) year, or (c) both. In the event of such termination/cancellation, Contractor would also be liable for any additional costs incurred by the State due to contract cancellation or loss of license or permit. See E-Verification / Good Faith Compliance attached.

3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

3.7.1 Delete Article 3.7.1 in its entirety and insert the following:

The Contractor shall secure and pay for the building permit and all other permits, fees, licenses, inspections and all other approvals and charges necessary for proper execution and completion of the Work.

3.7.3 Delete the words "knowing it to be" from Article 3.7.3.

3.8.2.3 Add the following to the end of Article 3.8.2.3;

. . . except when installation is specified to be included as part of the allowance in

the General Requirements (Division 1 of the Specifications).

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.3 Delete Article 3.10.3 in its entirety and insert the following:

Time being of the essence, the Contractor shall perform the Work in accordance with the most recent schedule submitted to and approved by the Owner and Architect.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.6 Add the following to the end of Article 3.12.6:

In reviewing Shop Drawings, Product Data, Samples and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

3.12.8 Add the following to the end of Article 3.12.8:

Unless such written notice has been given, the Architect's approval of a Shop Drawing, Product Data, Sample or similar submittal shall not constitute approval of any changes not requested on the prior submittal.

3.12.9 Add the following to the end of Article 3.12.9:

The Architect's review of the Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

3.18 INDEMNIFICATION

3.18.1 Add the word "defend" before the word "indemnify" in the first line, add the words "or nonperformance" after the word "performance" in the third line and delete the phrase which begins "provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself)," to the end of the sentence.

ARTICLE 4 - ARCHITECT

4.1.1 Add the following at the end of Article 4.1.1:

The term "Architect", "Engineer" or "Design Professional" as used in the Contract Documents refers to Canizaro Cawthon Davis
129 South President Street
Jackson, Mississippi 39201
(601) 948-7337

4.2 ADMINISTRATION OF THE CONTRACT

4.2.10 Delete Article 4.2.10 in its entirety.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Delete the phrase "Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract" from the first sentence of Article 5.2.1 and insert the following in lieu thereof:

"The Contractor, with its first Application for Payment and as a condition to the Owner's obligation to make payments to Contractor under Article 9 of the General Conditions as supplemented herein,"

5.2.5 Add the following:

The Contractor's unauthorized substitution of any subcontractor, supplier, person or entity previously identified by Contractor in accordance with Article 5.2.1 shall entitle the Owner to reject the work, materials or product furnished and require removal and replacement at no additional cost to the Owner.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

Delete Articles 6.1.1, 6.1.2, 6.1.3, 6.1.4 in their entirety and insert the following:

6.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces and to award separate contracts either in connection with other portions of the Project or other construction or operation on the site. In such event, the Contractor shall coordinate its activities with those of the Owner and of other contractors so as to facilitate the general progress of all work being performed by all parties. Cooperation will be required in the arrangement for the storage of materials, and in the detailed execution of the Work.

The Contractor, including his subcontractors, shall keep informed of the progress and the detailed work of the Owner or other contractors and shall immediately notify the Architect of lack of progress or delays by other contractors which are affecting Contractor's Work. Failure of Contractor to keep informed of the progress of the work of the Owner or other contractors and/or failure of Contractor to give notice of lack of progress or delays by the Owner or other contractors shall be deemed to be acceptance by Contractor of the status of progress by other contractors for the proper coordination and completion of Contractor's Work. If, through acts or neglect on the part of the Contractor, the Owner or any other contractors or subcontractor shall suffer loss or damage or assert any claims of whatever nature against the Owner, the Contractor shall defend, indemnify and hold harmless the Owner from any such claims

or alleged damages, and the Contractor shall resolve such alleged damages or claims directly with the other contractors or subcontractors.

6.2 MUTUAL RESPONSIBILITY

6.2.3 Delete Article 6.2.3 in its entirety.

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL

7.1.3 Add the following to the end of Article 7.1.3:

Except as permitted in Article 7.3, a change in the Contract Sum or the Contract Time shall only be accomplished by written change order. Therefore, the Contractor acknowledges that it is not entitled to a change in the Contract Sum or the Contract Time in the absence of a written change order on the basis of the course of conduct or dealings between the parties and/or the Owner's express or implied acceptance of alterations or additions to the Work and/or the Owner has been unjustly enriched by the Contractor's Work or any other basis otherwise allowed by law or the facts and Contractor agrees that any such extra or changed work was performed by it as a volunteer.

7.2 CHANGE ORDERS

7.2.2 Add the following Article 7.2.2:

Contractor's execution of a change order constitutes a final settlement to the Contract Sum and construction schedule and the Contract Time for all matters relating to or arising out of the change in the Work that is the subject of the change order including, but not limited to, all direct and indirect costs associated with such change, all extended direct job site and home office overhead expenses and any and all delay and impact cost for the change, whether alone or in combination with other changes, including any impact, ripple or cumulative effect resulting therefrom, if any.

7.2.3 Add the following Article 7.2.3:

Adjustments to the Contract Sum by change order shall be based upon one of the methods set forth in Article 7.3.3.1, 7.3.3.2, 7.3.3.3 or 7.3.3.4, as appropriate. A reasonable allowance for the combined overhead and profit included in the change order shall be based upon the schedule set forth in Article 7.3.11, as supplemented.

7.2.4 Add the following Article 7.2.4:

In order to facilitate consideration of change order requests, all such requests, except those involving an amount less than \$500 must be accompanied by a complete itemization of costs, including labor, materials and subcontractor costs which shall likewise be itemized. Changes for more than \$500 will not be

approved without such itemization.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.8 Delete the first sentence and insert the following:

The amount of credit to be given by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be the actual net cost plus reasonable allowance for overhead on net cost and profit thereon as approved by the Architect and Owner.

ARTICLE 8 – TIME

8.2 PROGRESS AND COMPLETION

8.2.1 Add the following to the end of the second sentence:

...and that the Contractor is fully capable of properly completing the Work within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.3 Add the following to the end of Article 8.3.3:

No delay, interference, hindrance or disruption, from whatever source or cause, in the progress of the Contractor's Work shall be a basis for an extension of time and/or additional compensation, unless the delay, interference, hindrance or disruption (1) is without the fault and not the responsibility of the Contractor, its subcontractors and/or suppliers and (2) directly affects the overall completion of the Work as reflected on the critical path of the Contractor's updated and accepted construction schedules. The Contractor expressly agrees that the Owner shall have the benefit of any float in the construction schedule and that delays to construction activities, which do not affect the overall completion of the Work, do not entitle the Contractor to any extension in the Contract Time and/or increase in Contract Sum.

8.3.4 Add the following Article 8.3.4:

All claims by the Contractor for an increase in the Contract Time must follow the procedures set forth in Articles 15.1.2 and 15.1.5, including the requirement that the Contractor give written notice of any claim within twenty-one (21) days after occurrence of the event giving rise to such claim or within twenty-one (21) days after the Contractor first recognizes the condition giving rise to the claim, whichever is earlier.

8.3.5 Add the following Article 8.3.5:

If the Contractor submits a schedule indicating or otherwise expressing an intent to complete the Work prior to the date of substantial completion, the Owner

shall have no liability to the Contractor for any failure by the Contractor to complete the Work prior to the expiration of the Contract Time.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATION FOR PAYMENTS

9.3.1 Add the following sentence to the end of Article 9.3.1:

The form of Application for Payment will be the current edition of the AIA Document G702, Application and Certification for Payment, supported with AIA Document G703, Continuation Sheet.

9.3.1.3 Add the following Article 9.3.1.3:

In any contract awarded by the state of Mississippi or any agency, unit or department of the State of Mississippi or by any political subdivision thereof, the amount of retainage that may be withheld is governed by Mississippi law.

9.3.2.1 Add the following Article 9.3.2.1:

Payment for materials stored at some location other than the Project site, may be approved by the Architect and the Owner after the Contractor has submitted the following items:

- .1 An acceptable Lease Agreement between the Contractor or one of its subcontractors or suppliers and the owner of the land, or building, where the materials are stored covering the specific area where the materials are located.
- .2 Consent of Surety or other acceptable bond to cover the materials stored off-site.
- .3 All Perils Insurance coverage for the full value of the materials stored off-site.
- .4 A Bill of Sale from the Manufacturer to the Contractor for the stored materials.
- .5 A complete list and inventory of materials manufactured, stored and delivered to the storage site and of materials removed from the storage site and delivered to the Project.
- .6 A review by the Architect of the materials stored off-site prior to release of payment.
- .7 Proof of payment of stored materials verified by the supplier must be submitted to the Architect within thirty (30) days of the Application for Payment on which payment for said materials was made. If proof of payment is not submitted within thirty (30) days, then payment for said materials will be deducted from the next application for payment and withheld until proof of payment is received.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1.7 Delete the word "repeated".

9.5.1.8 Add the following Article 9.5.1.8:

The letter from the Contractor which is required by Article 15.1.5.2 has not been received.

9.6 PROGRESS PAYMENTS

9.6.1 Delete Article 9.6.1 in its entirety and insert the following:

Subject to the conditions of the Contract, the Owner shall make payment to the Contractor in the amount certified within forty-five (45) days after receipt of the Certificate for Payment from the Architect. Payment shall not be considered late until forty-five (45) days after Owner's receipt of the approved Certificate for Payment from the Architect.

9.6.1.1 Contractor's Applications for Payment shall be submitted on or before the date established by the Owner in conjunction with the project meeting each month. Any application not submitted on or before this date may not be processed or approved until the following month.

9.6.7 Delete the word "Unless" from the first sentence and insert the phrase "Whether or not."

Add the following to the end of Article 9.6.7:

The amount retained by the Contractor from each payment to each Subcontractor and material supplier shall not exceed the percentage retained by the Owner from the Contractor for the Subcontractor's Work.

9.7 FAILURE OF PAYMENT

9.7 In the first sentence, delete the words "or awarded by binding dispute resolution". Change the word "seven" to "ten". After the phrase "or if the Owner"; insert "without good reason". Change the second occurrence of the word "seven" to "thirty (30)". Delete the second sentence and substitute the following: "The contract time shall be extended appropriately and interest as provided for in the contract document paid on the outstanding amount."

9.8 SUBSTANTIAL COMPLETION

9.8.1 Delete Article 9.8.1 in its entirety and insert the following:

At the Owner's discretion, the facility is complete and usable as per the intent and all building systems are fully functioning and all code requirements are acceptable. Substantial completion for purposes of this Contract occurs upon Contractor's compliance with the following conditions precedent: (a) the Contractor furnishes to the Architect all close-out documents required by the Contract Documents in a form satisfactory to the Architect and the Owner, (b) the Contractor furnishes the manufacturers' certifications and/or warranties required by the Contract Documents; (c) the Contractor furnishes the Guarantee of Work set forth herein below; and (d) the Architect certifies that the Work is sufficiently complete in accordance with the Contract Documents so that the

Owner can occupy or utilize the Work for its intended purpose.

The Guarantee of Work shall be submitted as a separate document signed by Contractor and Contractor's Surety and shall state the following:

Contractor and Contractor's Surety hereby guarantee that all Work performed on the Project is free from defective and/or nonconforming materials and workmanship and that for a period of one year from the date of final completion or such longer period of time as may be called for in the Contract Documents for such portions of the Work, Contractor or its Surety will repair and/or replace any defective and/or nonconforming materials and workmanship in accordance with the requirements of the Contract Documents.

9.8.2.1 Add the following Article 9.8.2.1:

The Contractor shall be responsible for the costs of inspections made by the Architect including any and all other related expenses incurred by the Architect for providing services for the Project required by failure of the Contractor to achieve final acceptance / completion of the Project within 30 days after the first occurrence of the below described events:

1. Specified date of Substantial Completion; or
2. Actual date of Substantial Completion.

The costs of the Architect's additional services shall be deducted by the Owner from the Contractor's final application for payment to pay the Architect for additional services required by the Contractor's failure to achieve final completion of the project within the 30 day period described above.

9.8.4 Delete the last sentence of Article 9.8.4 and insert the following:

Warranties required by the Contract Documents shall commence on the date of final acceptance/ completion unless otherwise provided in the Contract Documents.

9.8.5 Add the following to the end of Article 9.8.5:

Contractor's execution of the Certificate of Substantial Completion constitutes Contractor's representation that the items on the list accompanying the Certificate can and will be completed by Contractor and his subcontractors within thirty (30) days of Contractor's execution of the Certificate. Based upon this representation by Contractor and upon the acknowledgment of the Architect that the listed items remaining can be completed within thirty (30) days, the Owner agrees to execute the Certificate of Substantial Completion. If Contractor fails to complete the items on the list within thirty (30) days of Contractor's execution of the Certificate, then the Owner, at its option and without prejudice to any other rights or remedies it may have under this Contract or otherwise and without notice to Contractor or Surety, may proceed to have same completed and to deduct the reasonable costs thereof from the amounts then due or thereafter to become due to Contractor.

9.8.6 Add the following Article 9.8.6:

The costs of inspections requested by Contractor and made by Architect which are not required by Articles 4, 9.8 or 9.10 or 12 of the General Conditions and any other inspection required by Article 12 other than the year-end inspection itself, will be the responsibility of the Contractor and will be deducted by the Owner from the Application for Payment submitted after the Owner's receipt of the Architect's statement for its costs of additional inspections. These costs are not the result of Contractor's failure to timely complete the Contract within the specified time and, therefore, such costs are in addition to and not a part of any liquidated damages calculation, if any.

9.8.7 Add the following Article 9.8.7:

Upon the Owner's acceptance of the Work as substantially complete and upon Contractor's compliance with all conditions precedent to substantial completion as stated in Section 00 73 13, Article 9.8.1 and upon application by the Contractor, the Owner will pay to the Contractor all retainage held by the Owner less an amount equal to the greater of (a) two percent (2%) of the Contract Sum, or (b) two hundred percent (200%) of the estimated cost of the Work remaining to be performed by the Contractor in accordance with the Architect's determination. Final payment, including all retainage, shall be made at the time and in the manner provided for final payment in accordance with the provisions of Article 9.10 and the additional conditions precedent to final acceptance / payment set forth in Article 9.8.5.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1.2 Add the following Article 9.9.1.2:

The Owner's occupancy or use of any completed or partially completed portions of the Work shall not affect Contractor's obligation to complete incomplete items on the list attached to the Certificate of Substantial Completion within the time fixed in the Certificate and does not waive Owner's right to obtain completion of incomplete items at Contractor's expense upon Contractor's failure to timely complete same.

9.11 LIQUIDATED DAMAGES

Liquidated Damages. Time being of the essence of this Contract and a matter of material consideration thereof, a reasonable estimate in advance is established to cover losses incurred by the Owner if the Project is not substantially complete on the date set forth in the Contract Documents. The Contractor and his Surety will be liable for and will pay the Owner the sums hereinafter stipulated as fixed and agreed as liquidated damages for each calendar day for delay until the Work is substantially complete. The Contractor and his Surety acknowledge that the Owner's losses caused by the Contractor's delay are not readily ascertainable and that the amount estimated per day for liquidated damages is reasonable and is not a penalty.

The amount established per calendar day for liquidated damages is Five Hundred Dollars (\$500.00).

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following to the end of Article 10.1:

The Architect shall not administer the Contractor's performance of its duties and responsibilities under Article 10 (including Articles 10.1 through 10.6) because the initiation, maintenance and supervision of safety precautions and programs is the sole responsibility of the Contractor as means, methods, techniques, sequences and procedures of construction and, therefore, is not part of the Contractor's scope of Work which is to be administered by the Architect.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1.5 Delete the words "other than the Work itself".

11.1.1.9 Add the following Article 11.1.1.9:

Liability insurance will include all major divisions of coverage and be on a comprehensive basis including:

1. Premises - operations.
2. Independent Contractor's Protective.
3. Products and completed operations.
4. Contractual Liability- including specified provisions for the Contractor's obligations under 3.18.
5. Personal Injury Liability
6. Owned, non-owned and hired motor vehicles.
7. Broad form coverage for property damage.
8. Owner and Architect will be listed as additional insured on policy.

11.1.2 Delete Article 11.1.2 in its entirety and insert the following:

The insurance required by Article 11.1.1 will be written for not less than the following, or greater amounts if required by law or if deemed necessary by the Contractor to protect its interests.

.1 GENERAL LIABILITY:

Commercial General Liability
(Including XCU)

General Aggregate	\$ 2,000,000.00	Aggregate
Products & Completed Operations	\$ 2,000,000.00	Aggregate
Personal & Advertising Injury	\$ 1,000,000.00	Per Occurrence
Fire Damage Liability	\$ 500,000.00	Per Occurrence
Medical Expense	\$ 10,000.00	Per Person

.2 OWNERS & CONTRACTORS PROTECTIVE LIABILITY:

Bodily Injury & Property Damage	\$ 2,000,000.00	Aggregate
Bodily Injury & Property Damage	\$ 1,000,000.00	Per Occurrence

- .3 AUTOMOBILE LIABILITY:
(Owned, non-owned & hired vehicles)
- | | | |
|--|-----------------|----------------|
| Contractor Insurance Option Number 1: | | |
| Bodily Injury & Property Damage
(Combined Single Limit) | \$ 1,000,000.00 | Per Occurrence |
| Contractor Insurance Option Number 2: | | |
| Bodily Injury | \$ 500,000.00 | Per Occurrence |
| Bodily Injury | \$ 1,000,000.00 | Per Accident |
| Property Damage | \$ 100,000.00 | Per Occurrence |
- .4 EXCESS LIABILITY:
(Umbrella on projects over \$500,000)
- | | | |
|--|-----------------|----------------|
| Bodily Injury & Property Damage
(Combined Single Limit) | \$ 2,000,000.00 | Aggregate |
| | \$ 1,000,000.00 | Per Occurrence |
- .5 WORKERS' COMPENSATION:
(As required by Statute)
- EMPLOYERS' LIABILITY
- | | | |
|----------|---------------|----------------|
| Accident | \$ 100,000.00 | Per Occurrence |
| Disease | \$ 500,000.00 | Policy Limit |
| Disease | \$ 100,000.00 | Per Employee |
- .6 PROPERTY INSURANCE:
- | | | |
|-------------------------|----|------------------------|
| Builder's Risk | \$ | Must be equal to value |
| Or Installation Floater | | of work |

11.1.3 Add the following after the second sentence:

The Owner and Architect will be named as additional insureds on the Contractor's CGL policy and the Contractor's certificate of insurance must state that the Owner and Architect are additional insureds under the referenced CGL policy and that all of Contractor's contractual liabilities, including but not limited to its indemnity obligations, are covered by such CGL policy. Any language contained on the certificate of insurance form or elsewhere to the contrary is deemed stricken.

The certificate of insurance must also state that all of Contractor's contractual liabilities, including but not limited to its indemnity obligations, are covered. Any terms and conditions contained in the certificate of insurance which are contrary to the Contractor's contractual obligations are hereby stricken from the certificate.

11.1.5 Add the following Article 11.1.5:

Furnish one copy of the certificate herein required for each copy of the Agreement, specifically setting forth evidence of all coverage required by Article 11. The form of the certificate will be AIA Document G715 or a similar form acceptable to Owner. Furnish to the Owner and Architect, copies of any endorsements that are subsequently issued amending coverage or limits. If the coverages are provided on a claims-made basis, the policy date or retroactive date shall predate the Contract and the termination date of the policy, or the applicable extended reporting period shall be no earlier than the termination

date of coverages required to be maintained after final payment.

11.2 OWNER'S LIABILITY INSURANCE

11.2 Delete Article 11.2 in its entirety and insert the following:

The Contractor will pay for and maintain such insurance as will protect the Owner and Architect from their contingent liability to others for damages because of bodily injury, including death, which may arise from operations under this Contract and other liability for damages which the Contractor is required to insure under any provision of this Contract. Certificate of this insurance shall be filed with the Owner and Architect and will be the same limits set forth in Article 11.1.2.

11.3 PROPERTY INSURANCE

11.3.1 Delete the phrase "Unless otherwise provided, the Owner" from the first line and insert the phrase "The Contractor".

11.3.1.2 Delete Article 11.3.1.2 in its entirety and insert the following:

If the Contractor fails to purchase and maintain such insurance and the Owner is damaged by such failure, then the Contractor shall be liable to the Owner for all such damages incurred by the Owner.

11.3.1.3 Delete Article 11.3.1.3 in its entirety and insert the following:

If the property insurance requires minimum deductibles, the Contractor shall pay the deductible and all other costs not covered because of such deductibles. If the Contractor or insurer increases the required minimum deductibles above the amounts so identified or if the Contractor elects to purchase this insurance with voluntary deductible amounts, the Contractor shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles.

11.3.2 Delete Article 11.3.2 in its entirety.

11.3.3 Delete Article 11.3.3 in its entirety.

11.3.4 Delete Article 11.3.4 in its entirety.

11.3.5 Delete Article 11.3.5 in its entirety.

11.3.6 Delete Article 11.3.6 in its entirety.

11.3.7 Delete Article 11.3.7 in its entirety.

11.3.8 Delete Article 11.3.8 in its entirety.

11.3.9 Delete Article 11.3.9 in its entirety.

11.3.10 Delete Article 11.3.10 in its entirety and insert the following:

The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five (5) business days after occurrence of loss.

11.3.11 Add the following Article 11.3.11:

In addition to the above, the Contractor shall obtain in the Owner's and Architect's names, and maintain during the same time period, Public Protective Liability Insurance and Property Damage Insurance in the amount of not less than \$1,000,000 combined single limit, which policies shall cover the operations of the Contractor, and those of his subcontractors to protect the Owner and Architect from loss. This protection is not to be considered as a separate policy by the Contractor, but shall be a rider to the Contractor's coverage.

11.4.1 Delete Article 11.4.1 in its entirety and insert the following:

The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder in the amount of at least the contract sum and on forms approved by the Owner.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 Add the following to the end of Article 12.2.2.1:

Prior to the end of the one-year period, the Architect may schedule a warranty inspection which shall be attended by the Architect, the Owner, the Contractor and all major subcontractors. During this inspection, the parties shall identify all defective and/or nonconforming items and fix a time within which all defective and/or nonconforming items shall be repaired and/or replaced.

12.2.2.1.1 Add the following Article 12.2.2.1.1:

Within the one-year period provided for in the Guarantee of Work required by Article 9.8.1, if repairs or replacement are requested by Owner in connection with the Work which, in the opinion of the Owner, are rendered necessary as a result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the Contract Documents, the Contractor and/or its Surety shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such Work, correct all defects therein and make good all damages to the building, site, equipment or contents thereof; and make good any work or materials or the equipment and contents of said buildings or site disturbed in fulfilling any such guarantee. If, after notice or within the time agreed upon by the parties at the warranty inspection, the Contractor and/or its Surety fail to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected in accordance with Article 2.4 and the Contractor and his Surety shall

be liable for all expenses incurred. All special guarantees applicable to definite parts of the Work stipulated in the Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVENING LAW

13.1 Delete everything after the phrase “except that, if the parties have selected arbitration”.

13.6 INTEREST

13.6 Delete Article 13.6 in its entirety and insert the following:

Payments due and unpaid under the Contract Documents shall bear interest as provided by applicable Mississippi law.

13.7 Delete the phrase “in accordance with the requirements of the final dispute resolution method selected within the Agreement.”

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1.3 Add “without good cause” at the end, before “;or”.

14.1.1.4 Delete Article 14.1.1.4 in its entirety.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1.1 Delete the word “repeatedly” from Article 14.2.1.1.

14.2.1.3 Delete the word “repeatedly” from Article 14.2.1.3.

14.2.1.5 Add the following Articles 14.2.1.5 and 14.2.1.6:

.5 fails to achieve Substantial Completion of the Project as described in Article 9.8.5, within the time stated therein;

.6 fails to meet any deadline required by the Contract. Contractor acknowledges that time is of the essence of this Contract and that all deadlines required by the Contract are critical to timely completion of the Contract. Therefore, Contractor agrees that its failure to meet any deadline constitutes a substantial and material breach of this Contract, entitling the Owner to terminate the Contract.

14.2.2 Delete the word “certification” in the first sentence and insert the word “advice” and delete the phrase “Initial Decision Maker” and insert the word “Architect”.

14.2.4 Delete the phrase “Initial Decision Maker” and insert the word “Architect”.

14.2.5 Add the following Article 14.2.5:

If the Owner terminates the Contract for cause, and it is determined for any reason that the Contractor was not actually in default under the Contract at the time of termination, the Contractor shall be entitled to recover from the Owner the same amount as the Contractor would be entitled to receive under a termination for convenience as provided by Article 14.4. The foregoing shall constitute the Contractor's sole and exclusive remedy for termination of the Contract. In no event shall the Contractor be entitled to special, consequential, or exemplary damages, nor shall the Contractor be entitled to anticipated profits resulting from termination of this Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

- 14.4.3 Delete from the last line of Article 14.4.3 the phrase "along with reasonable overhead and profit on the Work not executed" and add after the end of that sentence: "The Contractor shall not be entitled to receive any payment for either overhead or profit on work not performed."

ARTICLE 15 - CLAIMS AND DISPUTES

15.1.5 CLAIMS FOR ADDITIONAL TIME

- 15.1.5.2 Add the following to the end of Article 15.1.5.2:

The Contractor must submit each month with his Application for Payment a separate letter stating that he is requesting an extension of time for abnormal adverse weather or that he has no claim for an extension for that period of time. Payment is not due on the Application for Payment until the letter is received. Complete justification, as per Article 8.3.6., including weather reports, daily reports, correspondence and any other supporting data must be provided for each day for which a request for time extension is made in compliance with Article 8.3.6. A letter or statement that the Contractor was delayed is not as adequate justification. The receipt of this request and data by the Architect will not be considered as Owner or Architect approval of a time extension in any way.

- 15.1.5.3 Add the following Article 15.1.5.3:

Claims for increase in the Contract Time shall set forth in detail the facts and circumstances which support such Claim, including but not limited to, the cause of such delay, the date such delay began to affect the critical path, the date such delay ceased to affect the critical path and the number of days of additional time requested. The Contractor shall not be entitled to an increase in the Contract Time for delays which did not affect the critical path or to the extent there were concurrent non-excusable delays. The Contractor may be requested to provide additional documentation to substantiate its Claim, including but not limited to, schedules that indicate all activities affected by such delay.

- 15.1.6 Delete this section in its entirety.

15.2 INITIAL DECISION

- 15.2.1 Delete the words “mediation of” and insert “litigating”.
- 15.2.3 Add at the end of the second sentence add “but grant such request shall be at the Owner’s sole discretion and the denial of such a request shall not, by itself, be the basis for a decision adverse to the Owner.”
- 15.2.4 Add “within thirty (30) days” to the end of Article 15.2.4.
- 15.2.5 Delete the phrase beginning “but subject to mediation and if the parties fail” and insert “unless a party files suit on the claim within 90 days following the Initial Decision Makers initial decision.”

PART 2 PRODUCTS Not Used

PART 3 PRODUCTS Not Used

END OF SECTION

SECTION 00732

SPECIAL CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Owner will use the Standard Form of Agreement between Owner and Contractor where the basis of payment is a Stipulated Sum, AIA Document A101, 2007 as a part of the Contract Documents.
- B. SPECIAL CONDITIONS OF THE CONTRACT
 - 1. The following special conditions shall be made a part of the Agreement between the Owner and Contractor:
 - a. The Davis-Bacon Act
 - b. The Contract Work Hours and Safety Standards Act
 - c. The Copeland Act (Anti-Kickback Act)
 - d. The Fair Labor Standards Act
 - e. E-Verification (Good Faith Compliance)
 - f. Federal Labor Standards Act
 - g. Special Provisions and Regulations Stipulated by U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant
 - h. City of Jackson Equal Business Opportunity (EBO) Plan
 - i. General Decision Number: MS20200051 01/03/2020
 - j. Excerpts from Code of Federal Regulations Title 24
- C. ATTACHMENTS
 - 1. See the attachments to the end of this Section that are to also be part of the Contract Documents.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

--END OF SECTION--

“Attachment A”
E-VERIFICATION
Good Faith Compliance

SENATE BILL NO. 2988 (As Passed by the Senate) This act shall take effect and be in force from and after July 1, 2008 for Purchased Service Contracts.

AN ACT TO CREATE THE MISSISSIPPI EMPLOYMENT PROTECTION ACT; TO PROVIDE PROCEDURES FOR NEWLY HIRED EMPLOYEES AND THEIR EMPLOYERS; TO ENACT DEFINITIONS; TO REQUIRE EMPLOYEE VERIFICATION; TO PROVIDE EMPLOYER LIABILITY; TO SET UP EMPLOYER-EMPLOYEE PROGRAMS; TO MAKE PROVISIONS FOR THIRD-PARTY EMPLOYERS; TO DEFER TO FEDERAL LAW IN STATE LAW; TO ENACT EXEMPTIONS; TO DESIGNATE ENFORCEMENT DUTIES UNDER THE ACT; TO PROVIDE PENALTIES FOR VIOLATIONS OF THIS ACT; AND FOR RELATED PURPOSES.

E-Verify Home Page: www.uscis.gov/portal/site/uscis
Click on E-Verify to Get Started

E-Verify Contact Information:

E-Verify Help Desk: 1-888-464-4218

Bob Fagan - Office of the Attorney General, State Personnel Board: 601-359-2704

E-Verification

Contractor represents and warrants that it will ensure its compliance with the Mississippi Employment Protection Act (Senate Bill 2988 from the 2008 Regular Legislative Session) and will register and participate in the status verification system for all newly hired employees. The term “employee” as used herein means any person that is hired to perform work within the State of Mississippi. As used herein, “status verification system” means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. Contractor agrees to maintain records of such compliance and, upon request of the State, to provide a copy of each such verification to the State. Contractor further represents and warrants that any person assigned to perform services hereunder meets the employment eligibility requirements of all immigration laws of the State of Mississippi. Contractor understands and agrees that any breach of these warranties may subject Contractor to the following: (a) termination of this Agreement and ineligibility for any state or public contract in Mississippi for up to three (3) years with notice of such cancellation/termination being made public, or (b) the loss of any license, permit, certification or other document granted to Contractor by an agency, department or governmental entity for the right to do business in Mississippi for up to one (1) year, or (c) both. In the event of such termination/cancellation, Contractor would also be liable for any additional costs incurred by the State due to contract cancellation or loss of license or permit.

I, the undersigned, certify, as an authorized representative, that my company is in compliance with the Mississippi Employment Protection Act (Senate Bill 2988) and will register and participate in the status verification system.

Company Name

Company Address

Company Tax Identification Number

Company Phone Number

Authorized Representative

“Attachment A”

Filename: 00732a Attach E-Verify Labor Protection.doc
Directory: H:
Template: C:\Users\john\AppData\Roaming\Microsoft\Templates\Normal.dotm
Title: E-VERIFICATION
Subject:
Author: dejones
Keywords:
Comments:
Creation Date: 2/26/2015 10:04:00 AM
Change Number: 6
Last Saved On: 1/19/2018 4:24:00 PM
Last Saved By: CCD Three
Total Editing Time: 25 Minutes
Last Printed On: 1/26/2018 2:43:00 PM
As of Last Complete Printing
Number of Pages: 1
Number of Words: 510 (approx.)
Number of Characters: 2,913 (approx.)

Federal Labor Standards Provisions

U.S. Department of Housing and Urban Development Office of Labor Relations

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section I(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract in the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section I(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section I(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who

is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be

awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

**SPECIAL PROVISIONS AND REGULATIONS
STIPULATED BY
THE U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) PROGRAM**

For the purpose of clarification, the Contracted Party shall refer to the firm providing professional or construction services to the Grantee as specified in the contract to which this document is attached.

1. Access of Grantee, State of Mississippi, HUD and Others to CDBG Documents, Papers, and Books

The Contracted Party agrees to allow the Grantee, State of Mississippi, HUD, the Comptroller General of the United States, and any of their duly authorized representatives access to any books, documents, papers, and records of the Contracted Party which are directly pertinent to the CDBG Program for the purpose of making audits, examinations, excerpts, and transcriptions.

2. Termination of Contract For Cause

If, through any cause, the Contracted Party shall fail to fulfill in timely and proper manner, his obligations, or stipulations of this Contract, the Grantee shall thereupon have the right to terminate this Contract by giving written notice to the Contracted Party of such termination and specifying the effective date of such termination. In such event, all finished or unfinished documents, data, studies and reports prepared by the Contracted Party shall entitle the Contracted Party's receipt of just and equitable compensation for any satisfactory work completed on such documents.

Notwithstanding the above, the contracted Party shall not be relieved of liability to the Grantee for damages sustained or the Grantee by virtue of any breach of the Contract by the Contracted Party. The Owner may withhold any payments to the Contracted Party for the purpose of set off until such time as the exact amount of damages due the Grantee from the Contracted Party is determined.

3. Termination for Convenience of the Grantee

The Grantee may terminate this contract any time by a notice in writing from the Grantee to the Contracted party. If the Contract is terminated by the Owner as provided herein, the Contracted Party will be paid an amount which bears the same ratio to the total compensation as the services actually performed bear to the total services of the Contracted Party covered by this Contract, less payments of compensation previously made provided that if less than sixty percent of the services covered by this Contract have been performed upon the effective date of such termination, the Contracted Party shall be reimbursed (in addition to the above payment) for that portion of actual out-of-pocket expenses (not otherwise reimbursed under this Contract) incurred by the Contracted

Party during the contract period which are directly attributable to the incomplete portion of the services covered by this Contract.

4. **Records**

All records required to be kept on the project shall be maintained for at least three years after final payments and until all other pending matters under the grant are closed.

5. **Health and Safety Standards**

All parties participating in this project agree to comply with Section 107 of the Contract Work Hours and Safety Standards Act. Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to this health and safety as determined under construction, safety, and health standards promulgated by the Secretary of Labor. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or contracts for transportation.

6. **Environmental Compliance**

Contracts, subcontracts, and subgrants of amounts in excess of \$100,000 shall comply with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 U.S.C. 1957 (h)), Section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency (EPA) regulations (40 CFR, 15), which prohibit the use under nonexempt Federal contracts, grants or loans of facilities included on the EPA List of Violating Facilities. The provisions shall require reporting of violations to the grantor agency and the U.S. EPA Assistant Administrator for Enforcement (EN-329).

7. **Energy Efficiency**

All participants in the projects shall recognize mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (PL-94-163).

8. **Changes**

The Grantee may, from time to time, request changes in the scope of the services of the Contracted Party to be performed hereunder. Such changes, including any increase or decrease in the amount of the Contracted Party compensation which are mutually agreed upon by and between the Grantee and the Contracted Party, shall be incorporated in written amendments to this Contract.

9. **Personnel**

The Contracted Party represents that it has, or will secure at its own expense, all personnel required in performing the services under this Contract. Such personnel shall not be employees of or have any contractual relationship with the Grantee.

All the services required hereunder will be performed by the Contracted Party or under its supervision, and all personnel engaged in the work shall be fully qualified and shall be authorized or permitted under State and local law to perform such services.

No person who is serving sentence in a penal or correctional institution shall be employed on work under this Contract.

10. **Anti-Kickback Rules**

Contracts, subcontracts, and subgrants shall comply with all applicable requirements of the Anti-Kickback Act of June 13, 1934 (48 Stat. 948; 62 Stat. 740; 63 Stat. 108; Title 18 U.S.C. 874; and Title 40 U.S.C. 276c).

Salaries of personnel performing work under this Contract shall be paid unconditionally and not less than once a month without payroll deduction or rebate on any account except only such payroll deductions as are mandatory by law or permitted by the applicable Anti-Kickback regulations issued by the Secretary of Labor.

11. **Withholding of Salaries**

If in the performance of this Contract, there is any underpayment of salaries by the Contracted Party or by any subcontracted thereunder, the Grantee shall withhold from the Contracted Party out of payment due to him an amount sufficient to pay to employees underpaid the difference between the salaries required thereby to be paid and the salaries actually paid such employees for the total number of hours worked. The amounts withheld shall be disbursed by the Grantee for and on account of the contracted party or subcontractor to the respective employees to whom they are due.

12. **Claims and Disputes Pertaining to Salary Rates**

Claims and disputes pertaining to salary rates or to classifications of professional staff or technicians performing work under this Contract shall be promptly reported in writing by the Contracted Party to the Grantee for the latter decision which shall be final with respect thereto.

13. Equal Employment Opportunity

During the performance of this Contract, the Contracted Party agrees to comply with Executive Order 11246, and the regulations issued pursuant thereto (24 CFR 130 and 41 CFR Chapter 60), which provides that no person shall be discriminated against on the basis of race, color, religion, gender, or national origin in all phases of employment during the performance of Federal or Federally assisted construction contracts. Contractors and subcontractors of Federal and Federally assisted construction contracts shall take affirmative action to ensure fair treatment in employments, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination, rates or pay or other forms of compensation and selection for training apprenticeship.

14. Anti-Discrimination Clauses

The Contracted Party will comply with the following clauses:

Title VI of the Civil Rights Act of 1964 (PL 88-352), and the regulations issued pursuant thereto (24 CFR 1), which provides that no person in the United States shall on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives Federal financial assistance and will immediately take any measures necessary to effectuate this assurance. If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the applicant, this assurance shall obligate the applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the Federal financial assistance is extended, or for another purpose involving the provision of similar services or benefits;

Title VIII of the Civil Rights Act of 1968 (PL 90-284), as amended, administering all programs and activities relating to housing and community development in a manner to affirmatively further fair housing, and taking action to affirmatively further fair housing in the sale or rental of housing, the financing of housing, and the provision of brokerage services;

Executive Order 11063, as amended by Executive Order 12259, on equal opportunity in housing and nondiscrimination in the sale or rental of housing built with Federal assistance; and

Section 109 of the Housing and Community Development Act of 1974, as amended which requires that no person in the United States shall on the grounds of race, color, national origin, or gender be excluded from participation in, be denied the benefits or be subjected to discrimination under, any program or activities funded in whole or in part with community development funds made available pursuant to the Act. Section 109 further provides that any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.) or with respect to an otherwise

qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 796) shall also apply to any such program or activity.

15. Section 3 Clause (See Attachment A)

The Contracted Party will comply with Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 17010) requiring that to the greatest extent feasible, opportunities for training and employment be given to lower income residents of the project area and contracts for work in connection with the project area be awarded to eligible business concerns which are located in or owned in substantial part by persons residing in the area of the project.

16. Discrimination Because of Certain Labor Matters

No person employed on the work covered by this Contract shall be discharged or in any way discriminated against because he has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable hereunder to his employer.

17. Compliance with Local Laws

The Contracted Party shall comply with all applicable laws, ordinances, and codes of the state and local governments, and shall commit no trespass on any public or private property in performing any of the work embraced by this Contract.

18. Subcontracting

None of the services covered by this Contract shall be subcontracted without prior written consent of the Grantee. The Contracted Party shall be as fully responsible to the Grantee for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by him. The Contracted Party shall insert in each subcontract appropriate provisions requiring compliance with the labor standards provisions of this Contract.

19. Assignability

The Contracted Party shall not assign any interest in this Contract, and shall not transfer any interest in the same (whether by assignment or novation) without prior written approval of the Grantee provided that claims for money due or to become due the Contracted Party from the Grantee under this Contract may be assigned to a bank, trust company, or other financial institution, or to a Trustee in Bankruptcy, without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Grantee.

20. Interest of Members of Local Public Agency and Others

The Contracted Party agrees to establish safeguards to prohibit employees from using positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have a family, business, or other tie.

The Contracted Party will comply with Section 21-39-1, Mississippi Code Annotated (1972), which prohibits municipal officers and employees from having or owning any interest or share, individually or as agent or employee of any person or corporation, either directly or indirectly, in any contract made or let by the governing authorities of such municipality for the construction or doing of any public work, or for the sale or purchase of any materials, supplies or property of any description, or for any other purpose whatsoever, or in any subcontract arising therefrom or connected therewith, or to receive, either directly or indirectly, any portion of share of any money or other thing paid for the construction or doing of any public work, or for the sale or purchase of any property, or upon any other contract made by the governing authorities of the municipality, or subcontract arising therefore or connected therewith.

The Contracted Party will also be aware of and avoid any violation of Section 97-11-19, Mississippi Code Annotated (Supp. 1982), which prescribes a criminal penalty for any public officer who has an interest in any contract passed by the board of which he is a member during the term he was a member and for one year thereafter.

21. Interest of Certain Federal Officers

No member of or delegate to the Congress of the United States and no Resident Commissioner, shall be admitted any share of part of this Contract or to any benefit to arise therefrom.

22. Interest of Contractor

The Contracted Party stipulates that they presently have no interest and shall not acquire any interest direct or indirect in the above described project or any parcels therein or any other interest which would conflict in any manner or degree with the performance of their services hereunder. The Contracted Party further agrees that in the performance of this Contract no person having any such interest shall be employed.

23. Political Activity

The Contracted Party will comply with the provisions of the Hatch Act (5 U.S.C. 1501 et seq.), which limits the political activity of employees.

24. Davis-Bacon Act Requirements

The Contracted Party will comply with Section 110 of the Housing and Community Development Act of 1974, as amended, which requires that all laborers and mechanics employed by contractors or subcontractor on construction work assisted under the Act shall be paid at rates not less than those prevailing on similar construction in the locality as determined by the Secretary of Labor in accordance with the Davis-Bacon Act, as amended (40 U.S.C. 276a-276a5), and it will comply with the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 *et seq.*). However, these requirements apply to the rehabilitation of residential property only if such property is designed for residential use of eight or more families.

25. Uniform Act Requirements

The Contracted Party will comply with all applicable requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. 4630) as specified in regulation issued by the Secretary of the Department of Housing and Urban Development and published in 24 CFR 570-1.

26. Lead-Based Paint Requirements

The Contracted Party will comply with Title IV of the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4831) which prohibits the use of lead-based paint in residential structures constructed or rehabilitated with Federal assistance in any form.

27. Compliance with Office of Management and Budget

The Contracted Party shall comply with the regulations, policies, guidelines, and requirements of the Office of Management and Budget, Circulars A-95, A-102, and A-54, as they relate to the use of Federal funds under this contract.

28. Flood Insurance Purchase Requirements

The Contracted Party shall comply with the flood insurance purchase requirements of Section 102 (2) of the Flood Disaster Protection Act of 1973, (PL 93-234, 87 Stat. 975) approved December 31, 1976. Section 102 (a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any Federal financial assistance for construction or acquisition purposes for use in any area that has been identified by the Secretary of Department of Housing and Urban Development as an area having special flood hazards. The phrase, Federal financial assistance, includes any form of loan, grant, guaranty, insurance payment, rebate, subsidy, disaster assistance loan or grant, any other form of direct or indirect Federal assistance.

29. Historic Preservation

The Contracted Party agrees to assist the Federal grantor agency in its compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (16 U.S.C. 470), Executive Order 11593, and the Archaeological and Historic Preservation Act of 1966 (16 U.S.C. 469a-1 *et seq.*) by (a) consulting with the State Historic Preservation officer on the conduct of investigations, as necessary, to identify properties listed in or eligible for inclusion in the National Register of Historic Places that are subject to adverse effects (CFR part 600.8) by the activity, and notifying the Federal grantor agency of the existence of any such properties, and by (b) complying with all requirements established by the Federal grantor agency and the state grantor agency to avoid or mitigate adverse effects upon such properties.

30. Program Monitoring

The Contracted Party agrees to assist and cooperate with the Federal grantor agency and the state grantor agency or their duly designated representatives in the monitoring of the project or projects to which this grant relates, and to provide in form and manner approved by the state grantor agency such monitoring reports, progress reports, and the like as may be required and to provide such reports at the times specified.

31. Procurement

The subgrantee must comply with all State and Federal laws dealing with the purchasing and acquisition for goods, services and other allowable cost as specified in the application.

32. Discrimination Due to Beliefs

No person with responsibilities in operation of the project to which this grant relates will discriminate with respect to any program participant or any applicant for participation in such program because of political affiliation or beliefs.

33. Confidential Findings

All of the reports, information data, etc., prepared or assembled by the Contracted Party under this Contract are confidential, and the Contracted Party agrees that they shall not be made available to any individual or organization without prior written approval of the Grantee.

34. Third-Party Contracts

Contracts, Subcontracts, and Subgrants of amounts in excess of \$2,000 shall include the following provisions.

Each Participating Party shall keep and maintain books, records, and other documents relating directly to the receipt and disbursement of such grant funds.

Any duly authorized representative of the Mississippi Development Authority, the U.S. Department of Housing and Urban Development, and the Comptroller General of the United States shall, at all reasonable times, have access to and the right to inspect, copy, audit, and examine all such books, records, and other documents of such Participating Party until the completion of all close-out procedures respecting this grant and the final settlement and conclusion of all issues arising out of this grant.

The Grantee shall include in all contracts with Participating Parties a provision that each Participating party agrees that any duly authorized representative of the Mississippi Development Authority, the U.S. Department of Housing and Urban Development, and Comptroller General of the United States shall, at all reasonable times, have access to any portion of the Project in which such Participating Party is involved until the completion of all close-out procedures respecting this grant.

35. Excessive Force

The contracted parties will adopt and enforce a policy of prohibiting the use of excessive force by law enforcement agencies within its jurisdiction any individuals engaged in nonviolent civil rights demonstrations; and enforcing applicable State and local laws against physically barring entrance to or exit from a facility or location which is the subject of such nonviolent civil rights demonstrations within its jurisdiction.

36. Architectural Barriers Act and Americans with Disabilities

The contracted parties will comply with the Architectural Barriers Act and the Americans with Disabilities as described in 24 CFR Sec 487 (e).

37. Mississippi Employment Protection Act of 2008

The contracted parties must comply with the Mississippi Employment Protection Act (Senate Bill 2988 of the 2008 Regular Session of the Mississippi Legislature) and must register and participate in the "status verification system" to verify the federal employment authorization status of all newly hired workers. As used herein, "status verification system" means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, and known as the E-Verify program. Failure to comply with the Mississippi Employment Protection Act of 2008 may result in: (a) termination of this Contract and ineligibility for any state or public contract in Mississippi for up to three (3) years; or (b) the loss of any license, permit, certification or other document granted to the Contractor by an agency, department or government entity for the right to do business in Mississippi for up to one(1) year; or (c) both.

ATTACHMENT A
SECTION THREE CLAUSE
(24 CFR Part 135:38):

All Section 3 covered contracts shall include the following clause (referred to as the Section 3 clause):

1. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development (HUD) Act of 1968, as amended, 12 U.S.C. 1701 u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assisted projects covered by Section 3 shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance.
2. The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.
3. The contractor agrees to send each labor organization or representative or worker with which the contractor has collective bargaining agreement or other understanding, if any, a notice advising the labor organization or worker's representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.
4. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice of knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.
5. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.
6. Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of contract for default, and debarment or suspension from future HUD assisted contracts.
7. With Respect to work performed in connection with Section 3 covered Indian Housing assistance, Section 7(b) of the Indian Self-determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible, (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7 (b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with Section 7 (b).

CITY OF JACKSON, MISSISSIPPI

Chokwe Antar Lumumba

Mayor

**EQUAL BUSINESS OPPORTUNITY (EBO)
PLAN**

**Department of Planning and Development
Division of Equal Business Opportunity**

**200 South President Street
Jackson, Mississippi 39205-0017
(601) 960-1856**

CITY OF JACKSON, MISSISSIPPI
EQUAL BUSINESS OPPORTUNITY EXECUTIVE
ORDER

LEGAL NOTICE

The City of Jackson is committed to the principle of non-discrimination in public contracting. It is the policy of the City of Jackson to promote full and equal business opportunity for all persons doing business with the City. As a pre-condition to selection, every contractor, bidder or offeror shall submit a *completed and signed* Equal Business Opportunity (EBO) Plan with the bid submission, in accordance with the provisions of the City of Jackson's Equal Business Opportunity (EBO) Executive Order. Failure to comply with the City's Executive Order shall disqualify a contractor, bidder or offeror from being awarded an eligible contract.

For more information on the City of Jackson's Equal Business Opportunity Program, please contact the Division of Equal Business Opportunity at 960-1856. Copies of the EBO Executive Order EBO Plan Application, EBO Program, the MBE/FBE Directory and the MBE/FBE Certification Affidavit are available at 200 South President Street, Suite 223, Jackson, Mississippi.



(EBO FORM 7-1-2013)

EQUAL BUSINESS OPPORTUNITY SPECIAL NOTICE TO BIDDERS

POLICY

The City of Jackson is committed to the principle of non-discrimination in public contracting. Therefore, the City of Jackson requests that prospective vendors and contractors carefully examine their method of selecting subcontractors and suppliers, to ensure that they are not either actively, or passively, discriminating against MBEs and FBEs. As a bidder seeking to do business with the City of Jackson, you are expected to adhere to a policy of non-discrimination, and to make the maximum practicable effort to ensure that historically underutilized firms are given an opportunity to participate in the performance of contracts financed in whole, or in part, with City funds.

DEFINITIONS

For purposes of this policy, the following definitions will apply:

- (1) **“African American Business Enterprise (AABE)”** shall mean a business that is an independent and continuing enterprise for profit, performing a commercially useful function and is owned and controlled by one or more African Americans and certified as such by the Division of Business Development.
- (2) **“Asian American Business Enterprise (ABE)”** shall mean a business that is an independent and continuing enterprise for profit, performing a commercially useful function and is owned and controlled by one or more Asian Americans, and certified as such by the Division of Business Development.
- (3) **“Hispanic Business Enterprise (HBE)”** shall mean a business that is an independent and continuing enterprise for profit performing a commercially useful function and is owned and controlled by one or more Hispanics, and certified as such by the Division of Business Development.
- (4) **“Minority Business Enterprise (MBE)”** shall mean a business which is an independent and continuing operation for profit, performing a commercially useful function as is owned and controlled by one or more non-White persons regardless of gender.
- (5) **“Female Business Enterprise (FBE)”** shall mean a business which is an independent and continuing enterprise for profit, performing a commercially useful function and is owned and controlled by one or more females regardless of any race and certified as such by the City of Jackson’s Division of Business Development.

OBLIGATION

The Contractor and any Subcontractor shall take all necessary and reasonable steps to ensure that MBEs and FBEs have a maximum opportunity to compete for and participate in the performance of any portion of the work included in this contract and shall not discriminate on the basis of race, color, national origin or sex. If it is determined that there is a significant underutilization of MBEs and FBEs, the Equal Business Opportunity Officer is empowered, pursuant to section 127-8 of the Equal Business Opportunity Executive Order, to conduct an investigation to determine the reasons for the underutilization.

GOALS

The goals for participation by MBEs and FBEs are established by the Equal Business Opportunity Executive Order of the City of Jackson. The Contractor shall exercise all necessary and reasonable steps to ensure that participation meets or exceeds the contract goals. The goals may be attained by subcontracting to, procuring materials from, and renting equipment from MBEs and FBEs. (See Subcontractor/Supplier Participation guidelines below.)

The Equal Business Opportunity participation goals are as follows:

PROCUREMENT CATEGORY	Asian (ABE)	African- American (AABE)	Hispanic (HBE)	Native American (NABE)	Female (FBE)
A/E & Professional Services	0.16	8.67	0.00	0.00	1.96
Construction	0.00	12.41	0.37	0.00	4.89
Goods & Non-Professional Services	0.04	6.78	0.02	0.00	3.03

Those portions of the contract that are proposed for MBEs and FBEs in the response to this bid shall be listed on the attached Equal Business Opportunity Plan.

For specific information about the Equal Business Opportunity Plan, please contact the Office Equal Business Opportunity at (601) 960-1856.

*Non-white female firms cannot be utilized twice on the EBO Plan even though those firms can be certified as either ABE, AABE, HBE, NABE, FBE or both. The firm can only be utilized in one category to fulfill the minority participation goals on the EBO Plan.

Contractors may employ AABEs, HBES, ABEs or FBEs to meet the applicable project goals through various methods, as follows:

A. Subcontractor Participation

- (i) Where a prime contractor utilizes one or more subcontractors to satisfy its equal business opportunity commitment, the prime contractor may count toward its EBO Plan only expenditures to MBE (AABE, HBE, or ABE) or FBE contractors that perform a commercially useful function in the work of the contract.
- (ii) An MBE or FBE subcontractor is considered to perform a commercially useful function when it is responsible for execution of a distinct element of the work of a contract and carries out its responsibilities by actually performing, managing and supervising the work involved. In determining whether an MBE or FBE subcontractor, is performing a commercially useful function, factors, including but not limited to the following, will be considered:
 - (a) the amount of work subcontracted;
 - (b) the type of prime contract;
 - (c) whether the business has the skill and expertise to perform work for which it is being/has been certified;
 - (d) whether the business actually performs, manages and supervises the work for which it is being/has been certified; and
 - (e) whether the business purchases goods and/or services from a non-minority/women

business enterprise and simply resells goods to the city, city contractor, or other person doing business with the city for the purpose of allowing those goods to be counted towards fulfillment of the minority/women business enterprise utilization goals.

- (f) standard industry practices.
- (iii) Consistent with standard industry practices, an MBE or FBE subcontractor may enter into second tier subcontracts. If an MBE or FBE subcontractor subcontracts a significantly greater portion of the work of its subcontract to a non-minority, non-female owned firm than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or FBE subcontractor is not performing a commercially useful function.

B. Suppliers Participation

Where a prime contractor utilizes one or more suppliers to satisfy its EBO commitment, in whole or in part, the MBE or FBE supplier participation may be credited towards the applicable goal as follows:

- (i) 100 percent of the contract amount for MBE or FBE suppliers who manufacture the goods supplied.
- (ii) 100 percent of the contract amount for MBE and FBE suppliers who are wholesalers warehousing the goods supplied or who are manufacturers' representatives, provided that only 25 percent of the applicable MBE or FBE goal may be attained by non-manufacturing supplier contracts to MBEs or FBEs.
- (iii) For those contracts where an extraordinarily large proportion of the contract price is for equipment or supplies, a lower project goal may be set than otherwise would be required, or the 25 percent limit for suppliers may be increased, or a combination of these two methods may be utilized.

C. Joint Ventures and Mentor-Protégé Programs

- (i) The Division of Equal Business Opportunity shall encourage, where economically feasible, the establishment of joint ventures and mentor protégé programs to ensure prime contracting opportunities for African American, Hispanic, Asian American, Native American and Female Business Enterprises on all eligible projects over \$3,000,000.00. Even if the prime itself is a MBE, a joint venture between prime contractors and MBEs is strongly encouraged on all projects exceeding three million dollars (\$3,000,000.00).
- (ii) Where a contractor engages in a joint venture to satisfy its Equal Business Opportunity Commitment, the Equal Business Opportunity Officer shall review and approve all contractual agreements regarding:
 - (a) The initial capital investment of each venture partner;
 - (b) The proportional allocation of profits and losses to each venture partner;
 - (c) The sharing of the right to control the ownership and management of the joint venture;
 - (d) Actual participation of the venture partners in the performance of the contract;
 - (e) The method of and responsibility for accounting;
 - (f) The methods by which disputes are resolved; and

- (g) Other pertinent factors of the joint venture.

On the basis of these factors, the Equal Business Opportunity Officer shall determine the degree of AABE, HBE, ABE, or FBE participation resulting from the joint venture that may be credited towards the applicable EBO goals of the project.

The bidder or offeror shall provide the Equal Business Opportunity Officer access to review all records pertaining to joint venture agreements before and after the award of a contract reasonably necessary to assess compliance with this policy.

The Equal Business Opportunity Program also encourages Mentor-Protégé programs to assist African American, Hispanic, Asian American, and Female business enterprises in financing, bonding, construction management and technical assistance. Mentor-Protégé agreements will be reviewed by the Equal Business Opportunity Officer for final approval of the following terms of each agreement:

- (a) type of technical assistance to be provided by mentor;
- (b) rights and responsibilities of each mentor and protégé contracting activity;
- (c) the specific duration of the agreement;
- (d) the amount of participation by the protégé that may be credited toward the applicable EBO goal.

EQUAL BUSINESS OPPORTUNITY PLAN

In accordance with Section IV of the City of Jackson's Equal Opportunity Executive Order No. 2015 – 3, each contractor, bidder or offeror shall submit a completed and signed Equal Business Opportunity Plan with bid submission. Such plan should be titled "Equal Business Opportunity Plan (EBO Plan)" and should include the following:

- A. Names, addresses and contact persons of each African American Business Enterprise, Asian Business Enterprise, Hispanic Business Enterprise, and Female Business Enterprise to be used in the contract.
- B. The type of work or service each African American Business Enterprise, Asian Business Enterprise, Hispanic Business Enterprise, and Female Business Enterprise will perform.
- C. The dollar value of the work or service to be performed by each African American Business Enterprise, Asian Business Enterprise, Hispanic Business Enterprise, and Female Business Enterprise.
- D. Scope of the work to be performed by each African American Business Enterprise, Asian Business Enterprise, Hispanic Business Enterprise, and Female Business Enterprise.

Waiver

If the EBO Plan does not meet the project goals, the bidder or offeror must seek a partial or total waiver of the project goals. The application for waiver of all or part of the project goals must include full documentary evidence of the bidder's or offeror's good faith efforts (*see EBO Plan Application*) to meet the project goals and why the request for waiver should be granted. The application shall be in writing and submitted as a part of the bid or offer. It should include a narrative, affidavits and/or exhibits which verify the actions taken by the bidder or offeror to meet the goals.

Replacement

If a MBE/FBE Subcontractor cannot perform satisfactorily, the Contractor shall take all necessary reasonable steps to replace the Subcontractor with another MBE/FBE Contractor. All MBE/FBE replacements must be approved by the EBO Review Committee and the Department. (See *EBO Plan Application*)

To demonstrate necessary reasonable efforts to replace any Subcontractor that is unable to perform successfully, the Contractor must document steps taken to subcontract with another MBE/FBE Contractor.

CITY OF JACKSON, MISSISSIPPI
EQUAL BUSINESS OPPORTUNITY PLAN

I. Company Name: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

Telephone: (_____) _____

E-mail: _____

II. Bid Name and Number: _____

III. PROPOSED MINORITY AND/OR FEMALE SUBCONTRACTORS: **(SEE ATTACHMENTS)**

If a prime contractor utilizes one or more suppliers to satisfy its EBO commitment, all MBE or FBE supplier participation will be credited in accordance to Section VI(C)(I) of the EBO Executive Order No. 2014-3

IV. Total Bid Amount: \$ _____

V. WAIVER REQUESTED ... ☐ *(If you fail to meet either or all of the EBO Participation Goals, check this box and follow the directions below to provide the required ***WAIVER STATEMENT***. The "Waiver Statement" should be submitted on company letterhead to the EBO Officer.)*

*** The bidder/offeror shall provide the following as evidence of its good faith efforts and will be evaluated on the same:**

- (a) Copies of written notification to MBEs and FBEs soliciting their participation as a subcontractor.
- (b) Evidence of efforts made to divide the work into economically feasible units in order to increase the likelihood of meeting the EBO participation goals.
- (c) Evidence of efforts made to negotiate with MBEs and/or FBEs, including, at a minimum:
 - 1. The names, addresses, and telephone numbers of the MBE and FBEs who were contacted.
 - 2. A description of the information provided to MBEs and FBEs regarding the plans and specifications for portions of the work to be performed.
 - 3. A statement of reasons why additional agreements with MBEs and FBEs, if needed to meet the stated goals, were not reached.
 - 4. Evidence of efforts made to assist the MBEs and FBEs contacted who need assistance in obtaining bonding and insurance which the bidder or offeror requires.

5. For each MBE and FBE contacted which the bidder or offeror considered to be not qualified, include a written statement of the reasons for the bidder's or offeror's conclusion.
6. Written quotes solicited from all MBEs and FBEs seeking subcontract work with Prime Contractors at the time of the bidding.
7. A statement with supporting documentation and affidavits indicating whether the offeror has used MBEs and/or FBEs as joint venture partners or subcontractors in past or present private sector contracts in Jackson.

**If you are unable to locate an MBE/FBE, please contact the Business Development Division at (601) 960-1055 or (601) 960-1856.*

VI. Minority and Female Business Enterprise Actual Participation for this Bid/Offer/Proposal:

(Please list your MBE and FBE Project Participation percentages (%) in the Table below.)*

PROCUREMENT CATEGORY	Asian (ABE)	African- American (AABE)	Hispanic (HBE)	Native American (NABE)	Female (FBE)
A/E & Professional Services					
Construction					
Goods & Non-Professional Services					

VII. REPLACEMENT OF MBE/FBE

If an MBE or FBE is not performing satisfactorily, it is the responsibility of the Prime Contractor to notify the EBO Office immediately both in writing and by phone. All MBE/FBE replacements must be approved by the Equal Business Opportunity Review Committee (EBORC). If these steps are not taken this will result in penalties as outlined in Section XI of the EBO Executive Order No. 2015-3

VIII. CERTIFICATION

I certify, under penalties of perjury, that the information contained in this Equal Business Opportunity Plan Application is true and accurate to the best of my knowledge, and that my company fully intends to utilize all MBEs and FBEs listed if awarded the proposed project and/or service and abide by all EBO guidelines.

Authorized Signature and Title

Date

PRINT "AUTHORIZED" NAME HERE: _____

EQUAL BUSINESS OPPORTUNITY PLAN APPLICATION -- ATTACHMENT

Proposed Minority/Female Business Enterprise Firms

Company Name: _____ Type Trade/Business: _____

Address: _____

City, State, ZIP: _____

Contact Person: _____

Telephone Number: _____

Type Minority Business (MBE/FBE):

_____ Female (FBE)
_____ African-American (AABE)
_____ Asian (ABE)
_____ Hispanic (HBE)
_____ Native American (NABE)

Type Minority Business (MBE/FBE) Involvement:

_____ Subcontractor _____ Supplier
_____ Joint Venture _____ Mentor-Protégé

Type Work or Service to be Performed: _____

Scope of Work to be Performed: _____

Dollar Value of the Work to Be Performed by the Minority Business (MBE and/or FBE): \$ _____

Percentage of MBE and/or FBE Participation: _____ %

Company Name: _____ Type Trade/Business: _____

Address: _____

City, State, ZIP: _____

Contact Person: _____

Telephone Number: _____

Type Minority Business (MBE/FBE):

_____ Female (FBE)
_____ African-American (AABE)
_____ Asian (ABE)
_____ Hispanic (HBE)
_____ Native American (NABE)

Type Minority Business (MBE/FBE) Involvement:

_____ Subcontractor _____ Supplier
_____ Joint Venture _____ Mentor-Protégé

Type Work or Service to be Performed: _____

Scope of Work to be Performed: _____

Dollar Value of the Work to Be Performed by the Minority Business (MBE and/or FBE): \$ _____

Percentage of MBE and/or FBE Participation: _____ %

Company Name: _____ Type Trade/Business: _____

Address: _____

City, State, ZIP: _____

Contact Person: _____

Telephone Number: _____

Type Minority Business (MBE/FBE):

_____ Female (FBE)
_____ African-American (AABE)
_____ Asian (ABE)
_____ Hispanic (HBE)
_____ Native American (NABE)

Type Minority Business (MBE/FBE) Involvement:

_____ Subcontractor _____ Supplier
_____ Joint Venture _____ Mentor-Protégé

Type Work or Service to be Performed: _____

Scope of Work to be Performed: _____

Dollar Value of the Work to Be Performed by the Minority Business (MBE and/or FBE): \$ _____

Percentage of MBE and/or FBE Participation: _____ %

Company Name: _____ Type Trade/Business: _____

Address: _____

City, State, ZIP: _____

Contact Person: _____

Telephone Number: _____

Type Minority Business (MBE/FBE):

_____ Female (FBE)
_____ African-American (AABE)
_____ Asian (ABE)
_____ Hispanic (HBE)
_____ Native American (NABE)

Type Minority Business (MBE/FBE) Involvement:

_____ Subcontractor _____ Supplier
_____ Joint Venture _____ Mentor-Protégé

Type Work or Service to be Performed: _____

Scope of Work to be Performed: _____

Dollar Value of the Work to Be Performed by the Minority Business (MBE and/or FBE): \$ _____

Percentage of MBE and/or FBE Participation: _____ %

"ATTACHMENT E"

"General Decision Number: MS20200051 01/03/2020

Superseded General Decision Number: MS20190051

State: Mississippi

Construction Type: Building

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

County: Hinds County in Mississippi.

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2020

ENGI0624-007 01/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Crane.....	\$ 26.20	12.30
Forklift.....	\$ 26.20	12.30

* IRON0798-009 01/01/2019

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 26.70	14.47

PLUM0568-008 11/01/2017

	Rates	Fringes
PIPEFITTER.....	\$ 25.76	9.37

SUMS2015-012 04/03/2017

	Rates	Fringes
BRICKLAYER.....	\$ 20.29	0.00
CARPENTER, Includes Drywall Hanging, and Form Work.....	\$ 15.33	4.42
CEMENT MASON/CONCRETE FINISHER...	\$ 16.92	0.00
ELECTRICIAN.....	\$ 23.40	8.02
IRONWORKER, STRUCTURAL.....	\$ 17.39	0.00
LABORER: Common or General.....	\$ 12.95	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 16.00	1.28
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 31.50	4.25
OPERATOR: Bulldozer.....	\$ 15.14	1.03
PAINTER (Brush and Roller).....	\$ 16.00	0.00
PLUMBER.....	\$ 19.78	2.14
ROOFER.....	\$ 16.93	0.00
SHEET METAL WORKER, Includes HVAC Duct Installation.....	\$ 18.00	0.35
TILE SETTER.....	\$ 18.00	0.00
TRUCK DRIVER: Dump Truck.....	\$ 14.47	0.41

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

=====

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date

for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION

"



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos)

24 C.F.R. Pt. 135, App.

Appendix to Part 135

Effective: January 6, 2016

[Currentness](#)

I. Examples of Efforts To Offer Training and Employment Opportunities to Section 3 Residents

- (1) Entering into “first source” hiring agreements with organizations representing [Section 3](#) residents.
- (2) Sponsoring a HUD-certified “Step-Up” employment and training program for [section 3](#) residents.
- (3) Establishing training programs, which are consistent with the requirements of the Department of Labor, for public and Indian housing residents and other section 3 residents in the building trades.
- (4) Advertising the training and employment positions by distributing flyers (which identify the positions to be filled, the qualifications required, and where to obtain additional information about the application process) to every occupied dwelling unit in the housing development or developments where category 1 or category 2 persons (as these terms are defined in [§ 135.34](#)) reside.
- (5) Advertising the training and employment positions by posting flyers (which identify the positions to be filled, the qualifications required, and where to obtain additional information about the application process) in the common areas or other prominent areas of the housing development or developments. For HAs, post such advertising in the housing development or developments where category 1 or category 2 persons reside; for all other recipients, post such advertising in the housing development or developments and transitional housing in the neighborhood or service area of the [section 3](#) covered project.
- (6) Contacting resident councils, resident management corporations, or other resident organizations, where they exist, in the housing development or developments where category 1 or category 2 persons reside, and community organizations in HUD-assisted neighborhoods, to request the assistance of these organizations in notifying residents of the training and employment positions to be filled.
- (7) Sponsoring (scheduling, advertising, financing or providing in-kind services) a job informational meeting to be conducted by an HA or contractor representative or representatives at a location in the housing development or developments where

category 1 or category 2 persons reside or in the neighborhood or service area of the [section 3](#) covered project.

(8) Arranging assistance in conducting job interviews and completing job applications for residents of the housing development or developments where category 1 or category 2 persons reside and in the neighborhood or service area in which a [section 3](#) project is located.

(9) Arranging for a location in the housing development or developments where category 1 persons reside, or the neighborhood or service area of the project, where job applications may be delivered to and collected by a recipient or contractor representative or representatives.

(10) Conducting job interviews at the housing development or developments where category 1 or category 2 persons reside, or at a location within the neighborhood or service area of the [section 3](#) covered project.

(11) Contacting agencies administering HUD Youthbuild programs, and requesting their assistance in recruiting HUD Youthbuild program participants for the HA's or contractor's training and employment positions.

(12) Consulting with State and local agencies administering training programs funded through JTPA or JOBS, probation and parole agencies, unemployment compensation programs, community organizations and other officials or organizations to assist with recruiting [Section 3](#) residents for the HA's or contractor's training and employment positions.

(13) Advertising the jobs to be filled through the local media, such as community television networks, newspapers of general circulation, and radio advertising.

(14) Employing a job coordinator, or contracting with a business concern that is licensed in the field of job placement (preferably one of the [section 3](#) business concerns identified in part 135), that will undertake, on behalf of the HA, other recipient or contractor, the efforts to match eligible and qualified [section 3](#) residents with the training and employment positions that the HA or contractor intends to fill.

(15) For an HA, employing [section 3](#) residents directly on either a permanent or a temporary basis to perform work generated by [section 3](#) assistance. (This type of employment is referred to as "force account labor" in HUD's Indian housing regulations. See [24 CFR 905.102](#), and § 905.201(a)(6).)

(16) Where there are more qualified [section 3](#) residents than there are positions to be filled, maintaining a file of eligible qualified [section 3](#) residents for future employment positions.

(17) Undertaking job counseling, education and related programs in association with local educational institutions.

(18) Undertaking such continued job training efforts as may be necessary to ensure the continued employment of [section 3](#) residents previously hired for employment opportunities.

(19) After selection of bidders but prior to execution of contracts, incorporating into the contract a negotiated provision for a specific number of public housing or other [section 3](#) residents to be trained or employed on the [section 3](#) covered assistance.

(20) Coordinating plans and implementation of economic development (e.g., job training and preparation, business development assistance for residents) with the planning for housing and community development.

II. Examples of Efforts To Award Contracts to Section 3 Business Concerns

(1) Utilizing procurement procedures for [section 3](#) business concerns similar to those provided in 24 CFR part 905 for business concerns owned by Native Americans (see section III of this Appendix).

(2) In determining the responsibility of potential contractors, consider their record of [section 3](#) compliance as evidenced by past actions and their current plans for the pending contract.

(3) Contacting business assistance agencies, minority contractors associations and community organizations to inform them of contracting opportunities and requesting their assistance in identifying [section 3](#) businesses which may solicit bids or proposals for contracts for work in connection with [section 3](#) covered assistance.

(4) Advertising contracting opportunities by posting notices, which provide general information about the work to be contracted and where to obtain additional information, in the common areas or other prominent areas of the housing development or developments owned and managed by the HA.

(5) For HAs, contacting resident councils, resident management corporations, or other resident organizations, where they exist, and requesting their assistance in identifying category 1 and category 2 business concerns.

(6) Providing written notice to all known [section 3](#) business concerns of the contracting opportunities. This notice should be in sufficient time to allow the [section 3](#) business concerns to respond to the bid invitations or request for proposals.

(7) Following up with [section 3](#) business concerns that have expressed interest in the contracting opportunities by contacting them to provide additional information on the contracting opportunities.

(8) Coordinating pre-bid meetings at which [section 3](#) business concerns could be informed of upcoming contracting and subcontracting opportunities.

(9) Carrying out workshops on contracting procedures and specific contract opportunities in a timely manner so that [section 3](#) business concerns can take advantage of upcoming contracting opportunities, with such information being made available in languages other than English where appropriate.

(10) Advising [section 3](#) business concerns as to where they may seek assistance to overcome limitations such as inability to obtain bonding, lines of credit, financing, or insurance.

(11) Arranging solicitations, times for the presentation of bids, quantities, specifications, and delivery schedules in ways to facilitate the participation of [section 3](#) business concerns.

- (12) Where appropriate, breaking out contract work items into economically feasible units to facilitate participation by [section 3](#) business concerns.
- (13) Contacting agencies administering HUD Youthbuild programs, and notifying these agencies of the contracting opportunities.
- (14) Advertising the contracting opportunities through trade association papers and newsletters, and through the local media, such as community television networks, newspapers of general circulation, and radio advertising.
- (15) Developing a list of eligible [section 3](#) business concerns.
- (16) For HAs, participating in the “Contracting with Resident–Owned Businesses” program provided under 24 CFR part 963.
- (17) Establishing or sponsoring programs designed to assist residents of public or Indian housing in the creation and development of resident-owned businesses.
- (18) Establishing numerical goals (number of awards and dollar amount of contracts) for award of contracts to [section 3](#) business concerns.
- (19) Supporting businesses which provide economic opportunities to low income persons by linking them to the support services available through the Small Business Administration (SBA), the Department of Commerce and comparable agencies at the State and local levels.
- (20) Encouraging financial institutions, in carrying out their responsibilities under the Community Reinvestment Act, to provide no or low interest loans for providing working capital and other financial business needs.
- (21) Actively supporting joint ventures with [section 3](#) business concerns.
- (22) Actively supporting the development or maintenance of business incubators which assist [Section 3](#) business concerns.

III. Examples of Procurement Procedures That Provide for Preference for Section 3 Business Concerns

This Section III provides specific procedures that may be followed by recipients and contractors (collectively, referred to as the “contracting party”) for implementing the [section 3](#) contracting preference for each of the competitive procurement methods authorized in [2 CFR 200.320](#).

- (1) Small Purchase Procedures. For [section 3](#) covered contracts aggregating no more than \$25,000, the methods set forth in this paragraph (1) or the more formal procedures set forth in paragraphs (2) and (3) of this Section III may be utilized.

(i) Solicitation.

(A) Quotations may be solicited by telephone, letter or other informal procedure provided that the manner of solicitation provides for participation by a reasonable number of competitive sources. At the time of solicitation, the parties must be informed of:

—the [section 3](#) covered contract to be awarded with sufficient specificity;

—the time within which quotations must be submitted; and

—the information that must be submitted with each quotation.

(B) If the method described in paragraph (i)(A) is utilized, there must be an attempt to obtain quotations from a minimum of three qualified sources in order to promote competition. Fewer than three quotations are acceptable when the contracting party has attempted, but has been unable, to obtain a sufficient number of competitive quotations. In unusual circumstances, the contracting party may accept the sole quotation received in response to a solicitation provided the price is reasonable. In all cases, the contracting party shall document the circumstances when it has been unable to obtain at least three quotations.

(ii) Award.

(A) Where the [section 3](#) covered contract is to be awarded based upon the lowest price, the contract shall be awarded to the qualified [section 3](#) business concern with the lowest responsive quotation, if it is reasonable and no more than 10 percent higher than the quotation of the lowest responsive quotation from any qualified source. If no responsive quotation by a qualified [section 3](#) business concern is within 10 percent of the lowest responsive quotation from any qualified source, the award shall be made to the source with the lowest quotation.

(B) Where the [section 3](#) covered contract is to be awarded based on factors other than price, a request for quotations shall be issued by developing the particulars of the solicitation, including a rating system for the assignment of points to evaluate the merits of each quotation. The solicitation shall identify all factors to be considered, including price or cost. The rating system shall provide for a range of 15 to 25 percent of the total number of available rating points to be set aside for the provision of preference for [section 3](#) business concerns. The purchase order shall be awarded to the responsible firm whose quotation is the most advantageous, considering price and all other factors specified in the rating system.

(2) Procurement by sealed bids (Invitations for Bids). Preference in the award of [section 3](#) covered contracts that are awarded under a sealed bid (IFB) process may be provided as follows:

(i) Bids shall be solicited from all businesses ([section 3](#) business concerns, and non-[section 3](#) business concerns). An award shall be made to the qualified [section 3](#) business concern with the highest priority ranking and with the lowest responsive bid if that bid—

(A) is within the maximum total contract price established in the contracting party's budget for the specific project for which bids are being taken, and

(B) is not more than “X” higher than the total bid price of the lowest responsive bid from any responsible bidder. “X” is determined as follows:

x=lesser of:	
When the lowest responsive bid is less than \$100,000	10% of that bid or \$9,000.
When the lowest responsive bid is:	
At least \$100,000, but less than \$200,000.....	9% of that bid, or \$16,000.
At least \$200,000, but less than \$300,000.....	8% of that bid, or \$21,000.
At least \$300,000, but less than \$400,000.....	7% of that bid, or \$24,000.
At least \$400,000, but less than \$500,000.....	6% of that bid, or \$25,000.
At least \$500,000, but less than \$1 million.....	5% of that bid, or \$40,000.
At least \$1 million, but less than \$2 million	4% of that bid, or \$60,000.
At least \$2 million, but less than \$4 million	3% of that bid, or \$80,000.
At least \$4 million, but less than \$7 million	2% of that bid, or \$105,000.
\$7 million or more.....	1 ½ % of the lowest responsive bid, with no dollar limit.

(ii) If no responsive bid by a [section 3](#) business concern meets the requirements of paragraph (2)(i) of this section, the contract shall be awarded to a responsible bidder with the lowest responsive bid.

(3) Procurement under the competitive proposals method of procurement (Request for Proposals (RFP)).

(i) For contracts and subcontracts awarded under the competitive proposals method of procurement ([2 CFR 200.320](#)), a Request for Proposals (RFP) shall identify all evaluation factors (and their relative importance) to be used to rate proposals.

(ii) One of the evaluation factors shall address both the preference for [section 3](#) business concerns and the acceptability of the strategy for meeting the greatest extent feasible requirement ([section 3](#) strategy), as disclosed in proposals submitted by all business concerns ([section 3](#) and non-[section 3](#) business concerns). This factor shall provide for a range of 15 to 25 percent of the total number of available points to be set aside for the evaluation of these two components.

(iii) The component of this evaluation factor designed to address the preference for [section 3](#) business concerns must establish a preference for these business concerns in the order of priority ranking as described in [24 CFR 135.36](#).

(iv) With respect to the second component (the acceptability of the [section 3](#) strategy), the RFP shall require the disclosure of the contractor's [section 3](#) strategy to comply with the [section 3](#) training and employment preference, or contracting preference, or both, if applicable. A determination of the contractor's responsibility will include the submission of an acceptable [section 3](#) strategy. The contract award shall be made to the responsible firm (either [section 3](#) or non-[section 3](#) business concern) whose proposal is determined most advantageous, considering price and all other factors specified in the RFP.

Credits

[[80 FR 75936](#), Dec. 7, 2015]

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.30

§ 135.30 Numerical goals for meeting the greatest extent feasible requirement.

Currentness

(a) General.

(1) Recipients and covered contractors may demonstrate compliance with the “greatest extent feasible” requirement of [section 3](#) by meeting the numerical goals set forth in this section for providing training, employment, and contracting opportunities to [section 3](#) residents and [section 3](#) business concerns.

(2) The goals established in this section apply to the entire amount of [section 3](#) covered assistance awarded to a recipient in any Federal Fiscal Year (FY), commencing with the first FY following the effective date of this rule.

(3) For recipients that do not engage in training, or hiring, but award contracts to contractors that will engage in training, hiring, and subcontracting, recipients must ensure that, to the greatest extent feasible, contractors will provide training, employment, and contracting opportunities to [section 3](#) residents and [section 3](#) business concerns.

(4) The numerical goals established in this section represent minimum numerical targets.

(b) Training and employment. The numerical goals set forth in paragraph (b) of this section apply to new hires. The numerical goals reflect the aggregate hires. Efforts to employ [section 3](#) residents, to the greatest extent feasible, should be made at all job levels.

(1) Numerical goals for [section 3](#) covered public and Indian housing programs. Recipients of [section 3](#) covered public and Indian housing assistance (as described in § 135.5) and their contractors and subcontractors may demonstrate compliance with this part by committing to employ [section 3](#) residents as:

- (i) 10 percent of the aggregate number of new hires for the one year period beginning in FY 1995;
 - (ii) 20 percent of the aggregate number of new hires for the one period beginning in FY 1996;
 - (iii) 30 percent of the aggregate number of new hires for one year period beginning in FY 1997 and continuing thereafter.
- (2) Numerical goals for other HUD programs covered by [section 3](#).
- (i) Recipients of [section 3](#) covered housing assistance provided under other HUD programs, and their contractors and subcontractors (unless the contract or subcontract awards do not meet the threshold specified in § 135.3(a)(3)) may demonstrate compliance with this part by committing to employ [section 3](#) residents as 10 percent of the aggregate number of new hires for each year over the duration of the [section 3](#) project;
 - (ii) Where a managing general partner or management agent is affiliated, in a given metropolitan area, with recipients of [section 3](#) covered housing assistance, for an aggregate of 500 or more units in any fiscal year, the managing partner or management agent may demonstrate compliance with this part by committing to employ [section 3](#) residents as:
 - (A) 10 percent of the aggregate number of new hires for the one year period beginning in FY 1995;
 - (B) 20 percent of the aggregate number of new hires for the one year period beginning in FY 1996;
 - (C) 30 percent of the aggregate number of new hires for the one year period beginning in FY 1997, and continuing thereafter.
- (3) Recipients of [section 3](#) covered community development assistance, and their contractors and subcontractors (unless the contract or subcontract awards do not meet the threshold specified in § 135.3(a)(3)) may demonstrate compliance with the requirements of this part by committing to employ [section 3](#) residents as:
- (i) 10 percent of the aggregate number of new hires for the one year period beginning in FY 1995;

(ii) 20 percent of the aggregate number of new hires for the one year period beginning in FY 1996; and

(iii) 30 percent of the aggregate number of new hires for the one year period beginning in FY 1997 and continuing thereafter.

(c) Contracts. Numerical goals set forth in paragraph (c) of this section apply to contracts awarded in connection with all [section 3](#) covered projects and [section 3](#) covered activities. Each recipient and contractor and subcontractor (unless the contract or subcontract awards do not meet the threshold specified in [§ 135.3\(a\)\(3\)](#)) may demonstrate compliance with the requirements of this part by committing to award to [section 3](#) business concerns:

(1) At least 10 percent of the total dollar amount of all [section 3](#) covered contracts for building trades work for maintenance, repair, modernization or development of public or Indian housing, or for building trades work arising in connection with housing rehabilitation, housing construction and other public construction; and

(2) At least three (3) percent of the total dollar amount of all other [section 3](#) covered contracts.

(d) Safe harbor and compliance determinations.

(1) In the absence of evidence to the contrary, a recipient that meets the minimum numerical goals set forth in this section will be considered to have complied with the [section 3](#) preference requirements.

(2) In evaluating compliance under subpart D of this part, a recipient that has not met the numerical goals set forth in this section has the burden of demonstrating why it was not feasible to meet the numerical goals set forth in this section. Such justification may include impediments encountered despite actions taken. A recipient or contractor also can indicate other economic opportunities, such as those listed in [§ 135.40](#), which were provided in its efforts to comply with [section 3](#) and the requirements of this part.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.32

§ 135.32 Responsibilities of the recipient.

Currentness

Each recipient has the responsibility to comply with [section 3](#) in its own operations, and ensure compliance in the operations of its contractors and subcontractors. This responsibility includes but may not be necessarily limited to:

- (a) Implementing procedures designed to notify [section 3](#) residents about training and employment opportunities generated by [section 3](#) covered assistance and [section 3](#) business concerns about contracting opportunities generated by [section 3](#) covered assistance;
- (b) Notifying potential contractors for [section 3](#) covered projects of the requirements of this part, and incorporating the [section 3](#) clause set forth in § 135.38 in all solicitations and contracts.
- (c) Facilitating the training and employment of [section 3](#) residents and the award of contracts to [section 3](#) business concerns by undertaking activities such as described in the Appendix to this part, as appropriate, to reach the goals set forth in § 135.30. Recipients, at their own discretion, may establish reasonable numerical goals for the training and employment of [section 3](#) residents and contract award to [section 3](#) business concerns that exceed those specified in § 135.30;
- (d) Assisting and actively cooperating with the Assistant Secretary in obtaining the compliance of contractors and subcontractors with the requirements of this part, and refraining from entering into any contract with any contractor where the recipient has notice or knowledge that the contractor has been found in violation of the regulations in 24 CFR part 135.
- (e) Documenting actions taken to comply with the requirements of this part, the results of actions taken and impediments, if any.
- (f) A State or county which distributes funds for [section 3](#) covered assistance to units of local governments, to the greatest

§ 135.32 Responsibilities of the recipient., 24 C.F.R. § 135.32

extent feasible, must attempt to reach the numerical goals set forth in 135.30 regardless of the number of local governments receiving funds from the [section 3](#) covered assistance which meet the thresholds for applicability set forth at 135.3. The State or county must inform units of local government to whom funds are distributed of the requirements of this part; assist local governments and their contractors in meeting the requirements and objectives of this part; and monitor the performance of local governments with respect to the objectives and requirements of this part.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.34

§ 135.34 Preference for section 3 residents in training and employment opportunities.

Currentness

(a) Order of providing preference. Recipients, contractors and subcontractors shall direct their efforts to provide, to the greatest extent feasible, training and employment opportunities generated from the expenditure of [section 3](#) covered assistance to section 3 residents in the order of priority provided in paragraph (a) of this section.

(1) Public and Indian housing programs. In public and Indian housing programs, efforts shall be directed to provide training and employment opportunities to section 3 residents in the following order of priority:

(i) Residents of the housing development or developments for which the [section 3](#) covered assistance is expended (category 1 residents);

(ii) Residents of other housing developments managed by the HA that is expending the [section 3](#) covered housing assistance (category 2 residents);

(iii) Participants in HUD Youthbuild programs being carried out in the metropolitan area (or nonmetropolitan county) in which the [section 3](#) covered assistance is expended (category 3 residents);

(iv) Other [section 3](#) residents.

(2) Housing and community development programs. In housing and community development programs, priority consideration shall be given, where feasible, to:

(i) [Section 3](#) residents residing in the service area or neighborhood in which the [section 3](#) covered project is located (collectively, referred to as category 1 residents); and

(ii) Participants in HUD Youthbuild programs (category 2 residents).

(iii) Where the [section 3](#) project is assisted under the Stewart B. McKinney Homeless Assistance Act ([42 U.S.C. 11301 et seq.](#)), homeless persons residing in the service area or neighborhood in which the [section 3](#) covered project is located shall be given the highest priority;

(iv) Other [section 3](#) residents.

(3) Recipients of housing assistance programs administered by the Assistant Secretary for Housing may, at their own discretion, provide preference to residents of the housing development receiving the [section 3](#) covered assistance within the service area or neighborhood where the [section 3](#) covered project is located.

(4) Recipients of community development programs may, at their own discretion, provide priority to recipients of government assistance for housing, including recipients of certificates or vouchers under the Section 8 housing assistance program, within the service area or neighborhood where the [section 3](#) covered project is located.

(b) Eligibility for preference. A [section 3](#) resident seeking the preference in training and employment provided by this part shall certify, or submit evidence to the recipient contractor or subcontractor, if requested, that the person is a [section 3](#) resident, as defined in [§ 135.5](#). (An example of evidence of eligibility for the preference is evidence of receipt of public assistance, or evidence of participation in a public assistance program.)

(c) Eligibility for employment. Nothing in this part shall be construed to require the employment of a [section 3](#) resident who does not meet the qualifications of the position to be filled.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.36

§ 135.36 Preference for section 3 business concerns in contracting opportunities.

Effective: January 6, 2016

Currentness

(a) Order of providing preference. Recipients, contractors and subcontractors shall direct their efforts to award [section 3](#) covered contracts, to the greatest extent feasible, to [section 3](#) business concerns in the order of priority provided in paragraph (a) of this section.

(1) Public and Indian housing programs. In public and Indian housing programs, efforts shall be directed to award contracts to [section 3](#) business concerns in the following order of priority:

(i) Business concerns that are 51 percent or more owned by residents of the housing development or developments for which the [section 3](#) covered assistance is expended, or whose full-time, permanent workforce includes 30 percent of these persons as employees (category 1 businesses);

(ii) Business concerns that are 51 percent or more owned by residents of other housing developments or developments managed by the HA that is expending the [section 3](#) covered assistance, or whose full-time, permanent workforce includes 30 percent of these persons as employees (category 2 businesses); or

(iii) HUD Youthbuild programs being carried out in the metropolitan area (or nonmetropolitan county) in which the [section 3](#) covered assistance is expended (category 3 businesses).

(iv) Business concerns that are 51 percent or more owned by [section 3](#) residents, or whose permanent, full-time workforce includes no less than 30 percent [section 3](#) residents (category 4 businesses), or that subcontract in excess of 25 percent of the total amount of subcontracts to business concerns identified in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(2) Housing and community development programs. In housing and community development programs, priority consideration shall be given, where feasible, to:

(i) [Section 3](#) business concerns that provide economic opportunities for section 3 residents in the service area or neighborhood in which the [section 3](#) covered project is located (category 1 businesses); and

(ii) Applicants (as this term is defined in [42 U.S.C. 12899](#)) selected to carry out HUD Youthbuild programs (category 2 businesses);

(iii) Other [section 3](#) business concerns.

(b) Eligibility for preference. A business concern seeking to qualify for a [section 3](#) contracting preference shall certify or submit evidence, if requested, that the business concern is a [section 3](#) business concern as defined in [§ 135.5](#).

(c) Ability to complete contract. A [section 3](#) business concern seeking a contract or a subcontract shall submit evidence to the recipient, contractor, or subcontractor (as applicable), if requested, sufficient to demonstrate to the satisfaction of the party awarding the contract that the business concern is responsible and has the ability to perform successfully under the terms and conditions of the proposed contract. (The ability to perform successfully under the terms and conditions of the proposed contract is required of all contractors and subcontractors subject to the procurement standards of [2 CFR 200.318\(h\)](#)). This regulation requires consideration of, among other factors, the potential contractor's record in complying with public policy requirements. [Section 3](#) compliance is a matter properly considered as part of this determination.

Credits

[[80 FR 75936](#), Dec. 7, 2015]

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.38

§ 135.38 Section 3 clause.

Currentness

All [section 3](#) covered contracts shall include the following clause (referred to as the [section 3](#) clause):

A. The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, [12 U.S.C. 1701u \(section 3\)](#). The purpose of [section 3](#) is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by [section 3](#), shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement [section 3](#). As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this [section 3](#) clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the [section 3](#) preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this [section 3](#) clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this [section 3](#) clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with [section 3](#) covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act ([25 U.S.C. 450e](#)) also applies to the work to be performed under this contract. [Section 7\(b\)](#) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of [section 3](#) and [section 7\(b\)](#) agree to comply with [section 3](#) to the maximum extent feasible, but not in derogation of compliance with [section 7\(b\)](#).

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart B. Economic Opportunities for Section 3 Residents and Section 3 Business Concerns

24 C.F.R. § 135.40

§ 135.40 Providing other economic opportunities.

Currentness

(a) General. In accordance with the findings of the Congress, as stated in [section 3](#), that other economic opportunities offer an effective means of empowering low-income persons, a recipient is encouraged to undertake efforts to provide to low-income persons economic opportunities other than training, employment, and contract awards, in connection with [section 3](#) covered assistance.

(b) Other training and employment related opportunities. Other economic opportunities to train and employ [section 3](#) residents include, but need not be limited to, use of “upward mobility”, “bridge” and trainee positions to fill vacancies; hiring [section 3](#) residents in management and maintenance positions within other housing developments; and hiring [section 3](#) residents in part-time positions.

(c) Other business related economic opportunities.

(1) A recipient or contractor may provide economic opportunities to establish, stabilize or expand [section 3](#) business concerns, including micro-enterprises. Such opportunities include, but are not limited to the formation of [section 3](#) joint ventures, financial support for affiliating with franchise development, use of labor only contracts for building trades, purchase of supplies and materials from housing authority resident-owned businesses, purchase of materials and supplies from PHA resident-owned businesses and use of procedures under 24 CFR part 963 regarding HA contracts to HA resident-owned businesses. A recipient or contractor may employ these methods directly or may provide incentives to non-[section 3](#) businesses to utilize such methods to provide other economic opportunities to low-income persons.

(2) A [section 3](#) joint venture means an association of business concerns, one of which qualifies as a [section 3](#) business concern, formed by written joint venture agreement to engage in and carry out a specific business venture for which purpose the business concerns combine their efforts, resources, and skills for joint profit, but not necessarily on a continuing or permanent basis for conducting business generally, and for which the [section 3](#) business concern:

(i) Is responsible for a clearly defined portion of the work to be performed and holds management responsibilities in the joint venture; and

(ii) Performs at least 25 percent of the work and is contractually entitled to compensation proportionate to its work.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.1

§ 135.1 Purpose.

Currentness

(a) [Section 3](#). The purpose of section 3 of the Housing and Urban Development Act of 1968 ([12 U.S.C. 1701u](#)) ([section 3](#)) is to ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

(b) Part 135. The purpose of this part is to establish the standards and procedures to be followed to ensure that the objectives of [section 3](#) are met.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.2

§ 135.2 Effective date of regulation.

Currentness

The regulations of this part will remain in effect until the date the final rule adopting the regulations of this part with or without changes is published and becomes effective, at which point the final rule will remain in effect.

Credits

[[60 FR 28326](#), May 31, 1995]

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment
Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.3

§ 135.3 Applicability.

Currentness

(a) [Section 3](#) covered assistance. [Section 3](#) applies to the following HUD assistance ([section 3](#) covered assistance):

(1) Public and Indian housing assistance. [Section 3](#) applies to training, employment, contracting and other economic opportunities arising from the expenditure of the following public and Indian housing assistance:

(i) Development assistance provided pursuant to section 5 of the U.S. Housing Act of 1937 (1937 Act);

(ii) Operating assistance provided pursuant to section 9 of the 1937 Act; and

(iii) Modernization assistance provided pursuant to section 14 of the 1937 Act;

(2) Housing and community development assistance. [Section 3](#) applies to training, employment, contracting and other economic opportunities arising in connection with the expenditure of housing assistance (including section 8 assistance, and including other housing assistance not administered by the Assistant Secretary of Housing) and community development assistance that is used for the following projects;

(i) Housing rehabilitation (including reduction and abatement of lead-based paint hazards, but excluding routine maintenance, repair and replacement);

(ii) Housing construction; and

(iii) Other public construction.

(3) Thresholds—

(i) No thresholds for [section 3](#) covered public and Indian housing assistance. The requirements of this part apply to [section 3](#) covered assistance provided to recipients, notwithstanding the amount of the assistance provided to the recipient. The requirements of this part apply to all contractors and subcontractors performing work in connection with projects and activities funded by public and Indian housing assistance covered by [section 3](#), regardless of the amount of the contract or subcontract.

(ii) Thresholds for [section 3](#) covered housing and community development assistance—

(A) Recipient thresholds. The requirements of this part apply to recipients of other housing and community development program assistance for a [section 3](#) covered project(s) for which the amount of the assistance exceeds \$200,000.

(B) Contractor and subcontractor thresholds. The requirements of this part apply to contractors and subcontractors performing work on [section 3](#) covered project(s) for which the amount of the assistance exceeds \$200,000; and the contract or subcontract exceeds \$100,000.

(C) Threshold met for recipients, but not contractors or subcontractors. If a recipient receives [section 3](#) covered housing or community development assistance in excess of \$200,000, but no contract exceeds \$100,000, the [section 3](#) preference requirements only apply to the recipient.

(b) Applicability of [section 3](#) to entire project or activity funded with [section 3](#) assistance. The requirements of this part apply to the entire project or activity that is funded with [section 3](#) covered assistance, regardless of whether the [section 3](#) activity is fully or partially funded with [section 3](#) covered assistance.

(c) Applicability to Indian housing authorities and Indian tribes. Indian housing authorities and tribes that receive HUD assistance described in paragraph (a) of this section shall comply with the procedures and requirements of this part to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act ([25 U.S.C. 450e\(b\)](#)). (See 24 CFR part 905.)

(d) Other HUD assistance and other Federal assistance. Recipients, contractors and subcontractors that receive HUD assistance, not listed in paragraph (a) of this section, or other Federal assistance, are encouraged to provide, to the greatest

extent feasible, training, employment, and contracting opportunities generated by the expenditure of this assistance to low- and very low-income persons, and business concerns owned by low- and very low-income persons, or which employ low- and very low-income persons.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.5

§ 135.5 Definitions.

Currentness

The terms Department, HUD, Indian housing authority (IHA), Public housing agency (PHA), and Secretary are defined in 24 CFR part 5.

Annual Contributions Contract (ACC) means the contract under the U.S. Housing Act of 1937 (1937 Act) between HUD and the PHA, or between HUD and the IHA, that contains the terms and conditions under which HUD assists the PHA or the IHA in providing decent, safe, and sanitary housing for low income families. The ACC must be in a form prescribed by HUD under which HUD agrees to provide assistance in the development, modernization and/or operation of a low income housing project under the 1937 Act, and the PHA or IHA agrees to develop, modernize and operate the project in compliance with all provisions of the ACC and the 1937 Act, and all HUD regulations and implementing requirements and procedures. (The ACC is not a form of procurement contract.)

Applicant means any entity which makes an application for [section 3](#) covered assistance, and includes, but is not limited to, any State, unit of local government, public housing agency, Indian housing authority, Indian tribe, or other public body, public or private nonprofit organization, private agency or institution, mortgagor, developer, limited dividend sponsor, builder, property manager, community housing development organization (CHDO), resident management corporation, resident council, or cooperative association.

Assistant Secretary means the Assistant Secretary for Fair Housing and Equal Opportunity.

Business concern means a business entity formed in accordance with State law, and which is licensed under State, county or municipal law to engage in the type of business activity for which it was formed.

Business concern that provides economic opportunities for low- and very low-income persons. See definition of “[section 3](#) business concern” in this section.

Contract. See the definition of “[section 3](#) covered contract” in this section.

Contractor means any entity which contracts to perform work generated by the expenditure of [section 3](#) covered assistance, or for work in connection with a [section 3](#) covered project.

Employment opportunities generated by [section 3](#) covered assistance means all employment opportunities generated by the expenditure of [section 3](#) covered public and Indian housing assistance (i.e., operating assistance, development assistance and modernization assistance, as described in [§ 135.3\(a\)\(1\)](#)). With respect to [section 3](#) covered housing and community development assistance, this term means all employment opportunities arising in connection with [section 3](#) covered projects (as described in [§ 135.3\(a\)\(2\)](#)), including management and administrative jobs connected with the [section 3](#) covered project. Management and administrative jobs include architectural, engineering or related professional services required to prepare plans, drawings, specifications, or work write-ups; and jobs directly related to administrative support of these activities, e.g., construction manager, relocation specialist, payroll clerk, etc.

Housing authority (HA) means, collectively, public housing agency and Indian housing authority.

Housing and community development assistance means any financial assistance provided or otherwise made available through a HUD housing or community development program through any grant, loan, loan guarantee, cooperative agreement, or contract, and includes community development funds in the form of community development block grants, and loans guaranteed under section 108 of the Housing and Community Development Act of 1974, as amended. Housing and community development assistance does not include financial assistance provided through a contract of insurance or guaranty.

Housing development means low-income housing owned, developed, or operated by public housing agencies or Indian housing authorities in accordance with HUD's public and Indian housing program regulations codified in 24 CFR Chapter IX.

HUD Youthbuild programs mean programs that receive assistance under subtitle D of Title IV of the National Affordable Housing Act, as amended by the Housing and Community Development Act of 1992 ([42 U.S.C. 12899](#)), and provide disadvantaged youth with opportunities for employment, education, leadership development, and training in the construction or rehabilitation of housing for homeless individuals and members of low- and very low-income families.

Indian tribes shall have the meaning given this term in 24 CFR part 571.

JTPA means the Job Training Partnership Act ([29 U.S.C. 1579\(a\)](#)).

Low-income person. See the definition of "[section 3](#) resident" in this section.

Metropolitan area means a metropolitan statistical area (MSA), as established by the Office of Management and Budget.

Neighborhood area means:

(1) For HUD housing programs, a geographical location within the jurisdiction of a unit of general local government (but not the entire jurisdiction) designated in ordinances, or other local documents as a neighborhood, village, or similar geographical designation.

(2) For HUD community development programs, see the definition, if provided, in the regulations for the applicable community development program, or the definition for this term in [24 CFR 570.204\(c\)\(1\)](#).

New hires mean full-time employees for permanent, temporary or seasonal employment opportunities.

Nonmetropolitan county means any county outside of a metropolitan area.

Other HUD programs means HUD programs, other than HUD public and Indian housing programs, that provide housing and community development assistance for “[section 3](#) covered projects,” as defined in this section.

Public housing resident has the meaning given this term in 24 CFR part 963.

Recipient means any entity which receives [section 3](#) covered assistance, directly from HUD or from another recipient and includes, but is not limited to, any State, unit of local government, PHA, IHA, Indian tribe, or other public body, public or private nonprofit organization, private agency or institution, mortgagor, developer, limited dividend sponsor, builder, property manager, community housing development organization, resident management corporation, resident council, or cooperative association. Recipient also includes any successor, assignee or transferee of any such entity, but does not include any ultimate beneficiary under the HUD program to which [section 3](#) applies and does not include contractors.

[Section 3](#) means section 3 of the Housing and Urban Development Act of 1968, as amended ([12 U.S.C. 1701u](#)).

[Section 3](#) business concern means a business concern, as defined in this section—

- (1) That is 51 percent or more owned by [section 3](#) residents; or
- (2) Whose permanent, full-time employees include persons, at least 30 percent of whom are currently [section 3](#) residents, or within three years of the date of first employment with the business concern were [section 3](#) residents; or
- (3) That provides evidence of a commitment to subcontract in excess of 25 percent of the dollar award of all subcontracts to be awarded to business concerns that meet the qualifications set forth in paragraphs (1) or (2) in this definition of “[section 3](#) business concern.”

[Section 3](#) clause means the contract provisions set forth in [§ 135.38](#).

[Section 3](#) covered activity means any activity which is funded by [section 3](#) covered assistance public and Indian housing assistance.

[Section 3](#) covered assistance means:

- (1) Public and Indian housing development assistance provided pursuant to [section 5](#) of the 1937 Act;
- (2) Public and Indian housing operating assistance provided pursuant to section 9 of the 1937 Act;
- (3) Public and Indian housing modernization assistance provided pursuant to section 14 of the 1937 Act;
- (4) Assistance provided under any HUD housing or community development program that is expended for work arising in connection with:
 - (i) Housing rehabilitation (including reduction and abatement of lead-based paint hazards, but excluding routine maintenance, repair and replacement);
 - (ii) Housing construction; or
 - (iii) Other public construction project (which includes other buildings or improvements, regardless of ownership).

[Section 3](#) covered contract means a contract or subcontract (including a professional service contract) awarded by a recipient or contractor for work generated by the expenditure of [section 3](#) covered assistance, or for work arising in connection with a [section 3](#) covered project. “[Section 3](#) covered contracts” do not include contracts awarded under HUD’s procurement program, which are governed by the Federal Acquisition Regulation System (see 48 CFR, Chapter 1). “[Section 3](#) covered contracts” also do not include contracts for the purchase of supplies and materials. However, whenever a contract for materials includes the installation of the materials, the contract constitutes a [section 3](#) covered contract. For example, a contract for the purchase and installation of a furnace would be a [section 3](#) covered contract because the contract is for work (i.e., the installation of the furnace) and thus is covered by [section 3](#).

[Section 3](#) covered project means the construction, reconstruction, conversion or rehabilitation of housing (including reduction and abatement of lead-based paint hazards), other public construction which includes buildings or improvements (regardless of ownership) assisted with housing or community development assistance.

[Section 3](#) joint venture. See § 135.40. [Section 3](#) resident means:

- (1) A public housing resident; or
- (2) An individual who resides in the metropolitan area or nonmetropolitan county in which the [section 3](#) covered assistance is expended, and who is:
 - (i) A low-income person, as this term is defined in section 3(b)(2) of the 1937 Act ([42 U.S.C. 1437a\(b\)\(2\)](#)). Section 3(b)(2) of the 1937 Act defines this term to mean families (including single persons) whose incomes do not exceed 80 per centum of the median income for the area, as determined by the Secretary, with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher or lower than 80 per centum of the median for the area on the basis of the Secretary’s findings that such variations are necessary because of prevailing levels of construction costs or unusually high or

low-income families; or

(ii) A very low-income person, as this term is defined in section 3(b)(2) of the 1937 Act ([42 U.S.C. 1437a\(b\)\(2\)](#)). Section 3(b)(2) of the 1937 Act ([42 U.S.C. 1437a\(b\)\(2\)](#)) defines this term to mean families (including single persons) whose incomes do not exceed 50 per centum of the median family income for the area, as determined by the Secretary with adjustments for smaller and larger families, except that the Secretary may establish income ceilings higher or lower than 50 per centum of the median for the area on the basis of the Secretary's findings that such variations are necessary because of unusually high or low family incomes.

(3) A person seeking the training and employment preference provided by [section 3](#) bears the responsibility of providing evidence (if requested) that the person is eligible for the preference.

Section 8 assistance means assistance provided under section 8 of the 1937 Act ([42 U.S.C. 1437f](#)) pursuant to 24 CFR part 882, subpart G.

Service area means the geographical area in which the persons benefitting from the [section 3](#) covered project reside. The service area shall not extend beyond the unit of general local government in which the [section 3](#) covered assistance is expended. In HUD's Indian housing programs, the service area, for IHAs established by an Indian tribe as a result of the exercise of the tribe's sovereign power, is limited to the area of tribal jurisdiction.

Subcontractor means any entity (other than a person who is an employee of the contractor) which has a contract with a contractor to undertake a portion of the contractor's obligation for the performance of work generated by the expenditure of [section 3](#) covered assistance, or arising in connection with a [section 3](#) covered project.

Very low-income person. See the definition of "[section 3](#) resident" in this section.

Youthbuild programs. See the definition of "HUD Youthbuild programs" in this section.

Credits

[[61 FR 5206](#), Feb. 9, 1996]

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.7

§ 135.7 Delegation of authority.

Currentness

Except as may be otherwise provided in this part, the functions and responsibilities of the Secretary under [section 3](#), and described in this part, are delegated to the Assistant Secretary for Fair Housing and Equal Opportunity. The Assistant Secretary is further authorized to redelegate functions and responsibilities to other employees of HUD; provided however, that the authority to issue rules and regulations under this part, which authority is delegated to the Assistant Secretary, may not be redelegated by the Assistant Secretary.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.9

§ 135.9 Requirements applicable to HUD NOFAs for section 3 covered programs.

Currentness

(a) Certification of compliance with part 135. All notices of funding availability (NOFAs) issued by HUD that announce the availability of funding covered by [section 3](#) shall include a provision in the NOFA that notifies applicants that [section 3](#) and the regulations in part 135 are applicable to funding awards made under the NOFA. Additionally the NOFA shall require as an application submission requirement (which may be specified in the NOFA or application kit) a certification by the applicant that the applicant will comply with the regulations in part 135. (For PHAs, this requirement will be met where a PHA Resolution in Support of the Application is submitted.) With respect to application evaluation, HUD will accept an applicant's certification unless there is evidence substantially challenging the certification.

(b) Statement of purpose in NOFAs.

(1) For competitively awarded assistance in which the grants are for activities administered by an HA, and those activities are anticipated to generate significant training, employment or contracting opportunities, the NOFA must include a statement that one of the purposes of the assistance is to give to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, job training, employment, contracting and other economic opportunities to [section 3](#) residents and [section 3](#) business concerns.

(2) For competitively awarded assistance involving housing rehabilitation, construction or other public construction, where the amount awarded to the applicant may exceed \$200,000, the NOFA must include a statement that one of the purposes of the assistance is to give, to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, job training, employment, contracting and other economic opportunities to [section 3](#) residents and [section 3](#) business concerns.

(c) [Section 3](#) as NOFA evaluation criteria. Where not otherwise precluded by statute, in the evaluation of applications for the award of assistance, consideration shall be given to the extent to which an applicant has demonstrated that it will train and employ [section 3](#) residents and contract with [section 3](#) business concerns for economic opportunities generated in connection with the assisted project or activity. The evaluation criteria to be utilized, and the rating points to be assigned, will be

specified in the NOFA.

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.



KeyCite Yellow Flag - Negative Treatment

Proposed Regulation

Code of Federal Regulations Title 24. Housing and Urban Development Subtitle B. Regulations Relating to Housing and Urban Development Chapter I. Office of Assistant Secretary for Equal Opportunity, Department of Housing and Urban Development (Refs & Annos) Subchapter B. Employment and Business Opportunity Part 135. Economic Opportunities for Low- and Very Low-Income Persons (Refs & Annos) Subpart A. General Provisions

24 C.F.R. § 135.11

§ 135.11 Other laws governing training, employment, and contracting.

Effective: January 6, 2016

Currentness

Other laws and requirements that are applicable or may be applicable to the economic opportunities generated from the expenditure of [section 3](#) covered assistance include, but are not necessarily limited to those listed in this section.

(a) Procurement standards for States and local governments 2 CFR part 200, subpart D—

(1) General. Nothing in this part 135 prescribes specific methods of procurement. However, neither [section 3](#) nor the requirements of this part 135 supersede the general requirement of [2 CFR 200.319](#) that all procurement transactions be conducted in a competitive manner. Consistent with [2 CFR 200.319](#), section 3 is a Federal statute that expressly encourages, to the maximum extent feasible, a geographic preference in the evaluation of bids or proposals.

(2) Flexible Subsidy Program. Multifamily project mortgagors in the Flexible Subsidy Program are not required to utilize the methods of procurement in [2 CFR 200.320](#), and are not permitted to utilize methods of procurement that would result in their award of a contract to a business concern that submits a bid higher than the lowest responsive bid. A multifamily project mortgagor, however, must ensure that, to the greatest extent feasible, the procurement practices it selects provide preference to [section 3](#) business concerns.

(b) Procurement standards for other recipients (2 CFR part 200, subpart D). Nothing in this part prescribes specific methods of procurement for grants and other agreements with institutions of higher education, hospitals, and other nonprofit organizations. Consistent with the requirements set forth in 2 CFR part 200, subpart D, [section 3](#) is a Federal statute that expressly encourages a geographic preference in the evaluation of bids or proposals.

(c) Federal labor standards provisions. Certain construction contracts are subject to compliance with the requirement to pay prevailing wages determined under Davis–Bacon Act ([40 U.S.C. 276a—276a–7](#)) and implementing U.S. Department of Labor regulations in 29 CFR part 5. Additionally, certain HUD-assisted rehabilitation and maintenance activities on public

and Indian housing developments are subject to compliance with the requirement to pay prevailing wage rates, as determined or adopted by HUD, to laborers and mechanics employed in this work. Apprentices and trainees may be utilized on this work only to the extent permitted under either Department of Labor regulations at 29 CFR part 5 or for work subject to HUD-determined prevailing wage rates, HUD policies and guidelines. These requirements include adherence to the wage rates and ratios of apprentices or trainees to journeymen set out in “approved apprenticeship and training programs,” as described in paragraph (d) of this section.

(d) Approved apprenticeship and trainee programs. Certain apprenticeship and trainee programs have been approved by various Federal agencies. Approved apprenticeship and trainee programs include: an apprenticeship program approved by the Bureau of Apprenticeship and Training of the Department of Labor, or a State Apprenticeship Agency, or an on-the-job training program approved by the Bureau of Apprenticeship and Training, in accordance with the regulations at 29 CFR part 5; or a training program approved by HUD in accordance with HUD policies and guidelines, as applicable. Participation in an approved apprenticeship program does not, in and of itself, demonstrate compliance with the regulations of this part.

(e) Compliance with [Executive Order 11246](#). Certain contractors covered by this part are subject to compliance with [Executive Order 11246](#), as amended by [Executive Order 12086](#), and the Department of Labor regulations issued pursuant thereto (41 CFR chapter 60) which provide that no person shall be discriminated against on the basis of race, color, religion, sex, or national origin in all phases of employment during the performance of Federal or Federally assisted construction contracts.

Credits

[[80 FR 75935](#), Dec. 7, 2015]

AUTHORITY: [12 U.S.C. 1701u](#); [42 U.S.C. 3535\(d\)](#).

Current through January 9, 2020; 85 FR 1128.

End of Document

© 2020 Thomson Reuters. No claim to original U.S. Government Works.

SECTION 01100

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work Covered: Work covered by the Contract Documents is as shown in drawings and described in words in the Project Manual. The Project Title and location is indicated on the first page of this Project Manual.
- B. Start of Work: Work shall be started immediately upon issuance of a *Notice to Proceed*. Prior to this, all Contracts and beginning documents will have been executed and insurance in force.
- C. Date of Completion: Five Hundred and Forty (540) days after the Notice to Proceed.
- D. Contractor's Duties:
 - 1. Except as specifically noted, provide and pay for:
 - a. Labor, materials and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Water, heat and utilities required for construction.
 - d. Other facilities and services necessary for proper execution and completion of the Work.
 - 2. Pay legally required sales, consumer, use, payroll, privilege and other taxes.
 - 3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at the time of the receipt of the bids:
 - a. Permits.
 - b. Government fees.
 - c. Licenses.
 - 4. Give required notices.
 - 5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.
 - 6. Promptly submit written notice to Professional of observed variance of Contract Documents from legal requirements. Assume responsibility for work known to be contrary to such requirements, without notice.
 - 7. Enforce strict discipline and good order among employees. Do not employ or work unfit persons, or persons, not skilled in assigned task, or any person to which the Architect and/or the Owner has an objection.
 - 8. Provide a written safety plan.
 - 9. Hazardous Materials: The Prime General Works Contractor is responsible for the removal and disposal of any hazardous materials encountered in the performance of the Contract requirements. Hazardous Containing Materials [HCM] include, but are not limited to, Asbestos and Mold Remediation, should be identified and removed as a part of the Contract.
- E. Subcontractor's List: A list of proposed subcontractors shall be provided. After award, each Prime Contractor will submit to the Owner and Architect a list of all Subcontractors to be used on the Project within seven (7) days after written notice of

contract award by the Owner. Any Subcontractor listed must be acceptable to the Owner and Architect. The contractor will replace any subcontractor or vendor against which the Owner or Architect has a responsible objection without any additional cost to the Owner.

- F. Coordination: Each Prime Contractor is responsible for the coordination of his total project. All Prime Contractors and Subcontractors will cooperate with the Architect, prosecuting his work as directed by the Architect. Each trade shall afford all other trades every opportunity for the installation of their work.

1.2 CONTRACTS

- A. Contracts: Construct work under a single Prime Contract. Refer to Section 0052 14 entitled *Standard Form of Agreement Between Owner and Contractor*.

1.3 WORK PHASES

- A. Phase 1 shall include demolition of existing structures located on the site except for the existing fire station facility.
- B. Phase 2 shall be construction of the replacement fire station including related site work.
- C. Phase 3 shall be the demolition of the existing fire station facility and related, filling, grading, and site work.

1.4 WORK OF OTHER CONTRACTS / OWNER VENDORS

- A. The owner will employ various vendors for selected portions of the work related to the radio tower, communications system, computer system, phone system and traffic light control system.
- B. Depending on selection of Alternates the owner may also employ other vendors related to those Alternate items.

1.5 OWNER-FURNISHED PRODUCTS

- A. Products Furnished By Owner: Products furnished by Owner shall be described in each appropriate Project Manual section and noted on the Drawings.
- B. Products: Owner furnished product will be delivered to site by the owner and unloaded at site by the contractor.
- C. Owner's Duties:
 - 1. Schedule delivery date with Supplier in accordance with construction schedule.
 - 2. Obtain installation drawings and instructions.
 - 3. Submit claims for transportation damages.
 - 4. Arrange Guarantees, Warranties, etc.
- D. Contractor's Duties:
 - 1. Designate required delivery date for each product in construction schedule.
 - 2. Promptly inspect delivered products, report missing, damaged, or defective items.
 - 3. Handle at site, including uncrating and storage.
 - 4. Protect from exposure to elements, from damage, vandalism and theft after

- delivery to site.
- 5. Repair or replace damaged items resulting from Contractor's operations.
- 6. Install and make final connections.

1.6 CONTRACTOR'S USE OF PREMISES

- A. Confine operations at site to areas permitted by:
 - 1. Law.
 - 2. Ordinances.
 - 3. Permits.
 - 4. Contract Documents.
 - 5. Owner.
- B. Do not unreasonably encumber site with materials or equipment.
- C. Do not load structure with weight that will endanger structure.
- D. Assume full responsibility for protection and safekeeping of products stored on premises.
- E. Move any stored products which interfere with operations of Owner or other Contractors.
- F. Obtain and pay for use of additional storage or work areas needed for operations.
- G. Limit use of site for work and storage to the area indicated in the drawings.
- H. Provide security for work in place and stored material.

1.7 SPECIFIC WORK SUMMARY

- A. Prime Contracts:
 - 1. General Construction
- B. Completeness of scope: Prime Contractor will be responsible for furnishing all labor, material equipment, supplies, supervision, lay-out, temporary facilities, coordination, scheduling and assundries shown, called for, necessary or required to complete in every respect the entirety of the work included in the scope of his work without relying on other Prime Contractor's except as specifically noted in the documents.
- C. Temporary facilities: The prime contractor will be responsible for temporary offices and storage facilities required for his work. The Prime Contractor will be responsible for all temporary utilities to the site and his temporary offices and storage facilities including cost of installation by local power company. The Prime Contractor shall furnish a trailer complete with power, water, holding tank and telephone lines for use by the Contractor and Professional. Provide a minimum 250 square feet for Professional's utilization.
- D. Temporary power: The Prime Contractor will be responsible for installation and distribution of temporary power and temporary lighting for the construction project. The Prime Contractor will make arrangements and pay any cost to have temporary power brought to the project site and distributed throughout the project. All temporary power will be ground fault protected.

The cost of power consumed monthly by the Construction Project will be paid by the Prime Contractor. The Prime Contractor shall post any refundable deposits required and pay the established rate.

- E. Temporary water: The Prime Contractor shall be responsible for temporary water service to the construction project. The Prime Contractor shall be responsible for any tap fees, meter fees and line cost charged by the local utilities. Protect temporary water service throughout the project.

The cost of water consumed monthly by the Construction Project will be paid by the Prime Contractor. The Prime Contractor shall post any refundable deposit required.

- F. Temporary toilets: The Prime Contractor shall furnish sufficient temporary toilets for all personal on the site. The contractor shall make arrangements for temporary sanitary accommodations for that trailer. Under no circumstances allow raw sewage to spill on the ground or into unpumped tanks.
- G. Erosion Control – The Prime Contractor shall erect and maintain throughout the life of the project, erosion control measures as are necessary to prevent silt and debris from this site washing onto adjacent property or into any drainage structure or Waters of the State. Provide silt fence, hay bales, ground cover and any practices or products required to prevent erosion. All work shall be in accordance with the Contractor's (CNOI) and SWPPP.
- H. Daily Reports – Each prime contractor's superintendent will prepare a report daily which includes as a minimum the contractor's forces on site by craft and skill level and their efforts of the day, supervision, material deliveries, problems encountered, inspections and their results, milestone achieved, significant items of work accomplished or attempted, delays or disruptions that occur, visitors and special instructions which effect their work. Provide this report in a form acceptable to the Architect on a weekly basis. Number each report in succession.
- I. Field Measurements:
 - 1. Employ an experienced, competent surveyor (licensed by the State of Mississippi) to establish the property lines, building lines, and at least two benchmarks at widely separated places. These bench marks shall be available for reference at all times. Any error or inconsistency shall be reported to the Architect, and its disposition obtained before work is begun.
 - 2. Provide "as built" drawing by the competent surveyor indicating location and elevation of new work. As built to be provided within ten (10) days of project Substantial Completion or within one hundred ten (110) calendar days of Notice to Proceed
 - 3. Two (2) copies of "As Built" survey to have contours indicated in one-foot intervals with both electronic and digital copies provided to the Architect and Owner.
 - 4. All underground valves, connection points, manholes, inlets, and drains associated with utilities shall have GPS coordinates indicated within 6 inches.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes a summary of separate contracts, including responsibilities under this contract for coordination, rough-ins, connections, temporary facilities and controls, and similar work.

1.2 COORDINATION

- A. Contractor shall be responsible for coordination between the General Construction Contract and separate contracts of the Owner.
 - 1. Separate Owner contracts include but are not limited to:
 - a. Radio tower system
 - b. Traffic light control system
 - c. Computer and data systems
 - d. 911 communication systems
 - e. Energy management systems
- B. Coordination activities of Contractor include, but are not limited to, the following:
 - 1. Provide overall coordination of the Work.
 - 2. Coordinate shared access to work spaces.
 - 3. Coordinate product selections for compatibility with other work.
 - 4. Provide overall coordination of temporary facilities and controls.
 - 5. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
 - 6. Coordinate construction and operations of the Work with work performed by other contracts, including sequencing and scheduling of the Work, including Owners work of separate contracts, and include on all project schedules.
 - 7. Coordinate sequencing and scheduling of the Work.
 - 8. Coordinate sequence of activities to accommodate tests and

inspections, and coordinate schedule of tests and inspections.

9. Provide progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
10. Coordinate cutting and patching.
11. Coordinate protection of the Work.
12. Coordinate fire-stopping.
13. Coordinate completion of interrelated punch list items.
14. Coordinate preparation of Project Record Documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
15. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.

1.3 INFORMATION FOR CONTRACTOR

A. The Owner will provide the Contractor with:

1. Product Data Sheets including installation information for the Contractor's use in coordinating the installation of the equipment and providing required rough-ins, blocking and other work required for the installation of equipment under a Separate Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide blocking, electrical and mechanical rough-ins, and other work as required by Product Data sheets provided by Owner.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for restricted use of premises for owner occupied areas.

1.2 USE OF PREMISES

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to areas indicated on drawings and areas as defined by Owner in pre-construction conference.
 - 2. Owner Occupancy: Allow for Owner occupancy of site.
 - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, tenants, users, patrons and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.3 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
- B. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install furnishings, fixtures and equipment in completed areas of building, before Substantial Completion, provided such occupancy does not unreasonably interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
4. On substantial completion of each phase of the Work, the Owner will assume responsibility for maintenance and custodial service for occupied portions of building but not including custodial service necessitated by the Contractor or the Contractors performance of the Work which shall remain the Contractor's responsibility.

1.4 TIME OF DAY RESTRICTIONS

- A. Where the Work does not unreasonably restricted or limit the Owner's use and operation of the existing facility the Contractor may perform the Work of this project during normal operating hours. Normal hours of operations are 24 hours per day.
- B. The Contractor shall coordinate work operations and work hour schedules with the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings.

1.2 CONTRACTOR RESPONSIBILITIES

- A. The General Contractor shall schedule and administer all project meetings including the pre-construction meeting, progress meetings and any additional meetings. The Contractor's responsibility will include the following:

1. Prepare agendas
2. Distribute written notice of meetings a minimum of five (5) days in advance of meeting date
3. Make physical arrangements for and preside at meetings.
4. Record minutes
5. Distribute copies of minutes to participants within four (4) days after meeting

- B. Pre-Construction Meeting: Schedule a pre-construction meeting within seven (7) days after date of Notice to Proceed.

1. Attendance:
 - a. Architect and architect's consultants
 - b. General Contractor
 - c. Major subcontractors
 - d. Representatives of governmental or other regulatory agencies
 - e. Representatives of the Owner
2. Minimum Agenda:
 - a. Distribute and discuss construction schedule
 - b. Critical work sequencing
 - c. Designation of responsible personnel
 - d. Procedures for maintaining record documents
 - e. Use of premises, including office and storage areas, parking
 - f. Owner's requirements
 - g. Security procedures

- h. Housekeeping procedures
 - i. Review Project Record Documents
- C. Progress Meetings: Progress meetings with Owner - Architect - Contractor present (OAC Meetings) shall be scheduled at least monthly and on an as-needed basis.
 - 1. Attendance:
 - a. Owner or Owner's representatives
 - b. Architect and Architect's consultants as pertinent to the agenda
 - c. General Contractor
 - d. Subcontractors as pertinent to the agenda
 - 2. Minimum Agenda:
 - a. Review, modify/approve minutes of the previous meeting
 - b. Review work progress since last meeting
 - c. Note field observations, problems and decisions
 - d. Identify problems which impede planned progress
 - e. Review off-site fabrication problems
 - f. Revise construction schedule and phasing as indicated
 - g. Plan progress during the next work period
 - h. Review proposed changes
 - i. Review Request for Payment
 - j. Review documentation of Project Record Documents
 - k. Complete other current business
 - 3. The Contractor shall have the following information available at OAC meetings:
 - a. Construction Drawings and Project Manual, including addenda and supplemental drawings.
 - b. RFI log, copies of RFI's, and responses.
 - c. Reviewed Shop Drawings and Product Submittals.
 - d. Other pertinent documents related to the progress of the project.
- D. Weekly Meetings: The General Contractor shall schedule and administer a weekly meeting and on an as-needed basis with key sub-contractors, suppliers and vendors relevant to the work required for that week. Notify Owner and Architect of scheduled meetings.
- E. Additional Meetings: The General Contractor shall schedule and administer any

additional project meetings that may be required by the Owner and other sections of these specifications. Notify Owner and Architect of scheduled meetings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01220

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.1 SCOPE

- A. This Section describes procedures for preparing and submitting Applications for Payment by the Contractor.

1.2 APPLICATIONS FOR PAYMENT

A. Format:

1. Applications for Payments will be prepared on AIA forms G702 - *Application and Certificate for Payment* and G703 - *Continuation Sheet*; or, a computer generated form containing similar data may be used.

B. Preparation of Application:

1. Present required information in typewritten form
2. Execute certification by signature of authorized officer
3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount broken down to indicate the various portions of the change order work as for an original Item of Work.
5. Prepare Application for Final Payment as specified in Section 01700 entitled Project Closeout.

C. Submittal Procedures:

1. Submit five (5) copies of each Application for Payment to the professional.
2. Submit with each Application for Payment an updated construction schedule as described in Section 01310, Project Coordination.
3. Submit requests for payment at intervals agreed upon by the Professional and Contractor. Present schedule update in accordance with Section 01220.
4. Submit requests to the Professional at agreed upon times, or as may be directed otherwise.

D. Substantiating Data:

1. Submit data justifying dollar amounts in question when such information is needed.
2. Provide one (1) copy of the data with a cover letter for each submittal.
3. Indicate the Application number, date and line item number and description.

E. Affidavit Certifying Payment to All Subcontractors

1. Submit to the Owner *Affidavit Certifying Payment to All Subcontractors* on a monthly basis after the submittal, approval and payment of Application for Payment #1.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

“Attachment A” to Section 01220 – Applications for Payment

**AFFIDAVIT CERTIFYING
PAYMENT TO ALL SUBCONTRACTORS**

I acknowledge that, pursuant to Miss. Code Ann. §31-5-25 and H.B. 1562, Laws of 2002, that I am required to submit monthly certification indicating payments to subcontractors on prior payment requests. I, the undersigned Contractor, do hereby certify that I have paid the following amounts to subcontractors for Work which has been performed and incorporated into previous Applications for Payment which were issued and payment received from the Owner on the project listed below. I understand that this document must be submitted on a monthly basis after the submittal, approval and payment of Application for Payment #1. I understand that the Owner reserves the right to require me, the undersigned, to provide verification of payment and/or additional information.

PROJECT NAME: Fire Station 20, City of Jackson, 4445 Medgar Evers, Jackson, MS

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

(Attach additional list of subcontractors and amounts, if necessary)

Contractor Name and Title: _____

Contractor Certificate of Responsibility Number: _____

Contractor Signature: _____ Date: _____

STATE OF MISSISSIPPI

COUNTY OF _____

SWORN TO AND SUBSCRIBED BEFORE ME, the undersigned notary public, this the
_____ day of _____, 20____.

NOTARY PUBLIC

My Commission Expires:

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section describes the changes to be made under each Alternate.
- B. The referenced drawings and/or specification sections contain the pertinent requirements to achieve the work described herein. Coordinate related work and modify surrounding work as required to complete the project under each Alternate designated in the contract.
- C. The Owner may elect to accept any or all alternates in any order or combination that they deem best suits the interest of the project.
- D. Alternate prices shall not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving bids.

1.2 DESCRIPTION OF ALTERNATES

- A. Deductive Alternate Number 1
 - 1. Delete Metal Ceiling in Rooms 115, 116, and 117. Expose structure and paint flat black. See Section 09546 - Linear Metal Ceilings and Reflected Ceiling Plan 1/A131.
 - 2. Delete Metal Ceiling Panels in Apparatus Bay 101 and paint exposed structure flat black. See Section 07421- Preformed Metal Panels, Reflected Ceiling Plan 1/A131, and related sections and details.
- B. Deductive Alternate Number 2
 - 1. Delete Screen at Porch. See Section 10290 - Insect Screen and Section 08410 - Aluminum Storefront for screen porch framing and screen door. See Large Scale Floor Plan 1/A123 and Large Scale Elevations 4/A411, 5/A411, 6/A411 and related details.
- C. Deductive Alternate Number 3
 - 1. Delete fire protection Sprinkler Systems and related pumps, piping, valves, vents, and exhaust fans as indicated on drawings and specified in Section 15375 - Sprinkler and Standpipe Systems.
- D. Deductive Alternate Number 4
 - 1. Delete Furniture as specified in Section 12500 - Furniture. See Drawing 1/A122 and related Furniture Schedule.
- E. Deductive Alternate Number 5
 - 1. Delete Washer and Dryer and PPE Washer and Dryer Cabinets as specified in Section 11452 - Appliances. See Drawing 1/A122.
- F. Deductive Alternate Number 6
 - 1. Delete Specialty Turn-out Gear Lockers as specified in Section 10505 - Metal Lockers. See Drawing 1/A122.

PART 2 PRODUCTS - Not used
PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01250

CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.1 SCOPE

- A. This Section describes the procedures for processing Change Orders by the Professional and the Contractor.

1.2 CHANGE ORDER PROCEDURES

- A. Change Proposed by Professional: The Professional may issue a Proposal Request to the Contractor which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications and a change in Contract Time for executing the change. The Contractor will prepare and submit an estimate within ten (10) days.
- B. Change Proposed by Contractor: The Contractor may propose a change by submitting a request for change to the Professional, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01630 - Substitutions and Product Options.
- C. Contractor's Documentation:
 - 1. Maintain detailed records of Work completed on a time and material basis. Provide full information required for evaluation of proposed changes, and substantiate costs of changes in the Work.
 - 2. Document each quotation for a change in cost or time with sufficient data allowing evaluation of the quotation.
 - 3. On request, provide additional data to support computations:
 - a. Quantities of products, labor, and equipment
 - b. Taxes, insurance and bonds
 - c. Overhead and profit
 - d. Justification for any change in Contract Time
 - e. Credit for deletions from Contract, similarly documented
 - 4. Support each claim for additional costs, and for Work completed on a time and material basis, with additional information:
 - a. Origin and date of claim
 - b. Dates and times work was performed and by whom
 - c. Time records and wage rates paid
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- D. Construction Change Directive: The Professional may issue a document, approved by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time. The change in Work will be promptly executed.
- E. Format: The Professional will prepare five (5) originals of the Change Order using the AIA Document G701/CMA *Change Order Form*.

- F. Types of Change Orders:
1. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation, or Contractor's request for a Change Order as approved by Architect.
 2. Unit Price Change Order:
 - a. For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.
 - b. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive.
 - c. Changes in Contract Sum or Contract Time will be computed as specified for Time and Material Change Order.
 3. Time and Material Change Order:
 - a. Submit itemized documentation to support request for Change Order.
 - b. Architect will review the documentation and determine the change allowable in Contract Sum and Contract Time as provided in the Contract Documents.
 4. Construction Change Directive
 - a. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
 - b. Promptly execute the change in Work.
- G. Execution of Change Order: The Professional will issue Change Orders for signatures of parties as provided in the Standard Form of Agreement Between the Owner and the Contractor. Final execution of all Change Orders requires approval by the Owner.
- H. Correlation of Contractor Submittals: The Contractor shall promptly revise Schedule of Values and the Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of Work affected by the change and resubmit. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirement for preparing and submitting the Schedule of Values.

1.2 SUBMITTALS

- A. Submit a Schedule of Values, including all subcontractors and materials bids, to the Architect at least fifteen (15) days prior to submitting first Application for Payment. Upon Architect's request, support the values given with data substantiating their correctness. List quantities of materials. Payment for materials stored on site will be limited to those listed in Schedule of Unit Material Values. Use only the Schedule of Values as basis for contractor's Application for Payment.
 - 1. Form of Submittal: Submit typewritten Schedule of Values on AIA Document G703 - latest edition, Continuation Sheet, using table of contents of this Project Manual as basis for format for listing costs of work for sections under Divisions 0 through Division 16. Identify each line item with number and title as listed in table of contents of this Project Manual.

1.3 PREPARING SCHEDULE OF VALUES

- A. Itemize separate line item cost for each division of major work, or itemize separate line item costs for work required by sections of this Project Manual. Break down installed cost indicating overhead and profit.
- B. Break down costs to list major products for operations under each item, rounding figures to nearest dollar. Total costs of all items listed in schedule shall equal the total contract sum.
- C. For each line item which has an installed value of more than ten thousand dollars (\$10,000), break down costs to list major products for operations under each item, rounding figures to nearest dollar. The sum of total costs of all items listed in schedule shall equal the total contract sum.
- D. All sub-contracts shall be similarly broken down as described above.
- E. Include line item amounts for Division 1 work. Include separate line items for each of the following Sections.
 - 1. Section 01700 - Project Closeout
 - a. Line item amount shall be equal to a minimum of One percent

(1%) of the total contract sum.

2. Section 01720 - Project Record Documents

- a. Line item amount shall be equal to a minimum of One percent (1%) of the total contract sum.

3. Section 01710 - Cleaning and Site Maintenance

- a. Line item amount shall be equal to a minimum of One percent (1%) of the total contract sum.
- b. Provide a line item value for each of the various types of maintenance and cleaning operations.

- F. Include line item amounts for specified mock-ups. Include separate line items for each specification section requiring a mock to be constructed.

1.4 PREPARING SCHEDULE OF UNIT MATERIAL VALUES

- A. Submit separate schedule of unit prices for materials to be stored for which progress payments will be made. Submit Unit Price Schedule of Values with each line item identified the same as each line item in Schedule of Values.
- B. Unit prices multiplied by quantities shall equal material cost of that item in schedule of values.

1.5 REVIEW AND RE-SUBMITTAL

- A. After Architect's review, the contractor shall revise and resubmit the Schedule of Values as indicated.
- B. Once approved, the cost shown for each line item is established as the accepted value of that item.

1.6 SUBSEQUENT MODIFICATIONS TO SCHEDULE OF VALUES

- A. Once the Schedule of Values on AIA Document G703 is approved by the Architect, the Contractor shall not modify the approved Schedule of Values, including Item No., Description of Work or Scheduled Value in any way on any subsequent applications.

1.7 CONTRACT MODIFICATIONS

- A. If the contract amount is subsequently modified by approved change order in accordance with Section 01250, Contract Modification Procedures, identify the change by its change order number (i.e., Change Order No.1) at the end of the Schedule of Values and provide a detailed breakdown of all components and values of that Change Order amount in accordance with the provisions of this Section. Submit Revised Schedule of Values to the Architect for review and approval prior to requesting any payment on the Change Order amount.

- B. Do not include any changes to the Contract Amount on the Schedule of Values unless an approved Change Order has been fully executed in accordance with Section 01250, Contract Modification Procedures.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes administrative provisions for procedures, conditions and responsibility for coordinating construction operations on the Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.

1.2 PROJECT SUPERINTENDENT AND PROJECT MANAGER

- A. The General Contractor will designate one individual as Project Superintendent and one individual as Project Manager.
 - 1. Prior to beginning work the name and qualifications of the Project Superintendent and Project Manager shall be submitted, in writing, to the Architect. Upon the approval of the Architect and the Owner, the Project Superintendent and Project Manager will remain until the project is completed and cannot be removed during construction without the prior written consent of the Owner and Architect. The general Contractor shall immediately replace the Project Superintendent and Project Manager if requested by the Owner and/or the Architect.
 - 2. The Project Superintendent and Project Manager shall each have a minimum of five years experience in coordinating, administering and supervising the work of projects similar in size and scope to the work of this project.

1.3 SUBMITTALS

- A. Submit name and qualifications of Project Superintendent and Project Manager including education, work experience, personal references, and list of successfully completed projects within fifteen (15) days of issuance of Notice to Proceed.
- B. Submit a list of principal staff assignments within fifteen (15) days of issuance of Notice to Proceed, including Project Superintendent, Project Manager, 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.

1.4 DUTIES OF PROJECT SUPERINTENDENT AND PROJECT MANAGER

- A. Duties of Project Superintendent and Project Manager shall include but not be limited to the duties listed in this Article.
- B. Coordinate the work of contractor's own forces, all subcontractors, and all material suppliers.
 - 1. Provide a list of all workforce present on site at any given time, by company and number of workmen, including contractor's own forces, subcontractors and material suppliers, when requested by the architect.
- C. Supervise the activities of every phase of work taking place on the project.
- D. Take special care to coordinate and supervise the work of the plumbing, heating cooling and electrical subcontractors.
- E. Establish lines of authority and communication at the job site.
- F. Superintendent and necessary assistants shall be present at the project site during performance of the work.
- G. Assist in obtaining building and special permits required for construction.
- H. Coordinate Owner furnished items required to be incorporated into the project.
- I. Interpretations of Contract Documents
 - 1. Consult with Architects and Engineers to obtain interpretations.
 - 2. Assist in resolution of any questions.
 - 3. Transmit written interpretations to concerned parties.
- J. Initiate or receive Request for Information (RFI)
 - 1. Submit Request for Information on AIA document G716-2004 or similar form as approved by Architect. If the contractor elects to use their own RFI form it must, at a minimum, contain the information delineated on G716-2004.
- K. Stop all work not in accordance with the requirements of the Contract Documents.
- L. Coordinate and assist in the preparation of all requirements of Division One and specifically as follows:
 - 1. Supervise and control all cutting and patching of other trades' work.
 - 2. Schedule and preside at all project meetings.
 - 3. Prepare and submit all construction schedules. Supervise work to monitor compliance with schedules.
 - 4. Administer the processing of all submittals required by the Project Manual.
 - 5. Assist in preparation and be knowledgeable of each entry in the Schedule of Values.

6. Coordinate all required testing.
 7. Allocate, maintain and monitor all temporary facilities.
 8. Administer the processing of all substitutions.
 9. Conduct final inspections and assist in collection and preparation of closeout documents.
 10. Direct and execute a continuing cleaning program throughout construction, requiring each trade to dispose of their debris.
 11. Maintain up-to-date project record documents.
 12. Enforce all safety requirements.
- M. Recommend and assist in the preparation of requests to the Architect for any changes in the contract.
- N. Assist in the preparation and be knowledgeable of each entry in the Application and Certificate for Payment.

1.5 SUBCONTRACTOR'S DUTIES

- A. The subcontractor shall coordinate and supervise employees of subcontractor in the work accomplished under the subcontract for that portion of the work.
- B. The subcontractor shall:
1. Conduct work to assure compliance with construction schedules.
 2. Transmit all instructions to his material suppliers.
 3. Cooperate with the Project Coordinator/Superintendent and other subcontractors.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This section includes administrative requirements for the preparation construction of schedules.

1.2 CONTRACTOR RESPONSIBILITIES

- A. Within fifteen (15) days of the Notice to Proceed the contractor shall provide projected Construction Schedules for the entire work and revise monthly to show progress through each pay period.

1.3 SUBMITTALS

- A. Submit initial schedules to the Architect within fifteen (15) days after date of notice to proceed.
- B. Submit to Architect, periodically updated schedules accurately depicting progress to first day of each month.
- C. Submit two (2) copies, one to be retained by the Architect and the other forwarded to the Owner.

1.4 PREPARING SCHEDULES

- A. Form of Schedules: Prepare in form of horizontal bar chart.
 - 1. Provide separate horizontal bar column for each trade or operation.
 - 2. Order shall be same as Table of Contents of Specifications.
 - 3. Identify each column by major specification section number.
 - 4. Horizontal Time Scale shall Identify first work day of each week.
 - 5. Scale and Spacing shall allow space for updating.
- B. Content of Schedules:
 - 1. Provide complete sequence of construction by activity.
 - 2. Indicate dates for beginning and completion of each stage of construction.
 - 3. Identify work of separate floors, separate phases, or other logically grouped activities.
 - 4. Show projected percentage of completion for each item of work as of first day of each month.
- C. Updating Schedules:
 - 1. Show all changes occurring since previous submission of updated schedule.

2. Indicate progress of each activity and completion dates.

- D. If the contractor is required to produce two revised construction schedules because of lack of progress in the work, the owner will notify the contractor's surety.

1.5 CONTRACTOR PHASING OF WORK

- A. Contractor shall phase construction so that all work of this contract causes no disruption of power, communications, air conditioning, lighting or existing operations. The following information is supplied for the contractors use in developing a phasing plan. See Section 01930 - Project Sequencing.

1. Work Phases

- a. Phase 1 shall include demolition of existing structures located on the site designated to be demolished except for the existing fire station facility.
- b. Phase 2 shall be construction of the replacement fire station including related site work.
- c. Phase 3 shall be the demolition of the existing fire station facility and related, filling, grading, and site work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes administrative requirements for preparation and submittal of shop drawings, product data, and samples.

1.2 SHOP DRAWINGS

- A. The Contractor shall furnish the Architect with such promptness as to cause no delay in this work or the work of any other contractors, shop drawings required by each specification section, for the Architect's approval.
- B. Original drawings shall be prepared by contractor, subcontractor, supplier or distributor (but in any event for which the General Contractor is responsible) which illustrate some portion of the work showing fabrication, layout, setting or erection details. Drawings shall be in Portable Document Format (PDF) submitted via e-mail. File may be provided on a compact disc if file is too large to send attached to an email. In addition to the PDF, submit up to two (2) printed copies if requested by the Architect. Shop Drawings shall:
 - 1. be prepared by a trained and experienced detailer using modern drawing techniques and processes. Reproductions of contract drawings, free hand sketches, not-to-scale line drawings, drawings reused from other projects and similar drawings will not be accepted.
 - 2. identify details by reference to sheet and detail numbers shown on contract drawings.
 - 3. be thorough in content and indicate all required parts, components, materials, procedures, dimensions, notes, construction, assemblies, fabrications and other related work.
 - 4. indicate all required sections, details, schedules and diagrams to thoroughly convey the information necessary for construction or fabrication.
 - 5. be of adequate scale to show detail, dimensions, construction, materials, attachments, components, parts, and pieces. Minimum scale for drawings shall be 1/8" = 1'-0" for plans and 3" = 1'-0" for details unless noted otherwise.
 - 6. be prepared on a minimum sheet size to indicate the entire portion of the work at the scale required and include project name, manufacturer's name, contractor's name, architect's name, date and title of drawing and other submission requirements.
 - 7. be thoroughly and completely reviewed by the Contractor and stamped and signed by the Contractor certifying accuracy, completeness, and compliance with contract requirements prior to submitting to the Architect. Contractor's comments and revisions shall be made in blue that is easily readable.
- C. The Architect's approval shall not relieve the contractor from responsibility for errors in shop drawings. Shop drawings are the instruments of the Contractor, not the Architect. The Contract Documents, including Drawings and

Specifications, shall always be final.

- D. Electronic CADD files of floor plans may be available to the Contractor upon written request to the Architect. Contractor will be required to sign a hold harmless and release of liability agreement and pay Two Hundred and Fifty Dollars (\$250) for each drawing provided to cover expenses prior to Architect releasing any drawing.

1.3 PRODUCT DATA

- A. The Contractor shall furnish the Architect, with such promptness as to cause no delay in this work or the work of any other contractors, the product data required by each specification section.
- B. Product Data shall be in Portable Document Format (PDF) and submitted via e-mail. File may be provided on a compact disc if file is too large to send attached to an email. In addition to the PDF, submit up to two (2) printed copies if requested by the Architect.
 - 1. Manufacturer's standard schematic drawings modified to delete information which is not applicable to the project. Supplement standard information to provide additional information applicable to project.
 - 2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data. Clearly mark each copy to identify pertinent materials, products or models. Show dimensions and clearances required. Show performance characteristics and capacities, wiring diagrams and controls.
 - 3. All door hardware catalog sheets / product data sheets shall be labeled with the item number corresponding to the hardware schedule submittal. The item number shall be clearly and legibly marked in the upper right hand of all product sheets. Failure to provide marked data sheets shall be reason for rejection.
- C. Product Data shall be thoroughly reviewed, stamped, and signed by the Contractor certifying accuracy, completeness and compliance with the contract requirements prior to submitting to the Architect. Contractor's comments and revisions shall be made in blue that is easily readable.
- D. The Architect's approval shall not relieve the contractor from responsibility for errors in product data. Product data is the instrument of the Contractor not the Architect.

1.4 SAMPLES

- A. The Contractor shall furnish the Architect, with such promptness as to cause no delay in this work or the work of any other contractors the samples required by each specification section. The General Contractor shall secure and submit to the Architect for his consideration, samples of each kind and grade of materials and finish as noted under the various headings of the specifications. These samples shall be finished completely and shall accurately represent the work as it is proposed to be installed. If such samples are rejected, the General Contractor shall, without delay, submit corrected samples for approval, and shall continue to do so until such approval is given by the Architect. All approvals will be given by the Architect to the General Contractor in writing.
- B. Physical examples shall illustrate materials, equipment, or workmanship and shall be used to establish standard by which completed work is judged.

- C. Samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of products or material with integrally related parts and attachment devices and full range of color samples. After review, samples remain the property of the Architect until completion of the construction project.
- D. A label shall be permanently affixed to each sample. The label shall identify the manufacturer, model and/or series number, color, texture, style and other information as necessary to accurately identify the product.
- E. In addition to the physical samples, submit an image of each sample in Portable Document Format (PDF) via e-mail. File may be provided on a compact disc if file is too large to send attached to an email. The image shall include the sample label and the label information shall be legible.

1.5 CONTRACTOR RESPONSIBILITIES

- A. Thoroughly review shop drawings, product data, and samples for conformance with the Contract Documents prior to submission. Shop drawings, product data and samples that indicate obvious evidence that the contractor has not conducted a through review shall be rejected by the Architect and returned without review.
- B. Verify field measurements, field construction criteria, catalog numbers and similar data.
- C. Coordinate each submittal with requirements of the Contract Documents.
- D. Shop drawings shall be fully coordinated with, reviewed and approved by subcontractors whose contract work comes in contact with, is related to or interferes with the work of other subcontractors.
- E. The Contractor is responsible for errors and omissions in submittals.
- F. Notify Architect in writing at the time of submission, of deviations in submittals from requirements of contract documents. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by Architect's review of submittals unless Architect gives written acceptance of specific deviations.
- G. Begin no work requiring submittals until the return of submittals bearing Architect's stamp and initials or signature indicating review.
- H. Distribute copies after Architect's review.

1.6 SUBMISSION REQUIREMENTS

- A. Schedule submission with ample time before the date that reviewed submittals will be needed.
- B. Accompany submittals with transmittal letter containing Architect's project title and number, contractor's name and address, the quantity of each shop drawing, submittal number, product data and samples submitted, notification of deviations from contract documents and other pertinent data.
- C. Submit all items delineated in the Submittal article of each specification section as a single submittal package. Partial submittals will not be reviewed.
- D. Submittals shall be a single PDF document including all items listed under the Submittal article for that Section and arranged in the following order as applicable to the submittal.

1. Transmittal letter
 2. Shop Drawings
 3. Product Data
 4. Image of Sample
- E. Portable Document Format (PDF) file shall be named with a Submittal Number.
1. Submit a separate PDF file for each Submittal Number/Specification Section.
 2. PDF file shall be named with the Submittal Number. The format of the Submittal Number shall be as follows:
 - a. Architect's Project Number-Specification Section Number-Series Number. Example: 16004-09250-01
 - b. Subsequent submittals and revisions from the same Specification Section shall be identified with a new Series Number in sequence.
- F. Submit number of samples specified in each specification Section.
- G. Submittals shall include:
1. Date and revision dates.
 2. Project title and number.
 3. The names of the Architect/Engineer, Contractor, Supplier, Manufacturer, and separate detailer, when applicable.
 4. Identification of product or material.
 5. Relation to adjacent structure or materials.
 6. Required details at an appropriate scale to indicate all required components, parts, pieces and materials.
 7. Field dimensions, clearly identified as such.
 8. Specification section number.
 9. Applicable standards such as ASTM number, ANSI number, Federal Specification number.
 10. Provide a 5 inch x 8 inch blank space for the Architect and Engineer stamps.
 11. Identification of deviations from contract documents.
 12. Contractor's stamp, initialed or signed, certifying that the Contractor has thoroughly reviewed the submittal for verification of field measurements and compliance with contract documents.
- H. Submittals not in full compliance with the provisions of this Article shall be rejected and returned without review.

1.7 RESUBMISSION REQUIREMENTS

- A. Shop Drawings: Revise initial drawings as required and resubmit as specified for initial submittal. Indicate on drawings, any changes which have been made other than those required by Architect/Engineer.
- B. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.8 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

- A. Distribute copies of shop drawings and product data which carry Architect/Engineer's stamp to the Contractor's File, Job Site File, Subcontractor, Supplier and Fabricator.
- B. Distribute samples as directed.

1.9 ARCHITECTS DUTIES

- A. Review submittals with reasonable promptness
- B. Review for design concept of project and information given in contract documents
- C. Review of separate item does not constitute review of an assembly in which item functions
- D. Affix stamp or transmittal and initial or signature certifying review of submittal.
- E. Return submittals to contractor for distribution
- F. Distribute one copy of accepted submittals to the owner

1.10 DELAYS

- A. Delays attributable to untimely submittals, rejections or resubmissions will not serve as a basis for a contract time extension.

1.11 ACCEPTANCE

- A. Acceptance of submittal items will not preclude rejection of these items upon discovery of defects in them prior to final acceptance of completed work.
- B. After an item has been accepted, no change in brand, make, manufacturer's catalog number, or characteristics will be considered unless:
 - 1. Satisfactory written evidence is presented to and approved by the Architect, that manufacturer cannot make scheduled delivery of accepted item.
 - 2. Item delivered has been rejected and substitution of a suitable item is an urgent necessity.
 - 3. Other conditions became apparent which indicates acceptance of such substitute item to be in the best interest of the owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall employ one or more special inspectors to provide inspections during construction and shall employ testing laboratory to perform all tests.
- B. Special inspection and testing shall meet the requirements of the *International Building Code* Section 1704. Requirements and forms for structural special inspections and testing are included.
 - 1. Statement of Structural Special Inspections.
 - 2. Special Inspection Final Report.
 - 3. Qualifications of Inspections and Testing Technicians.
 - 4. Special Inspection Daily Report.
 - 5. Special Inspection Weekly Report.
 - 6. Special Inspection Discrepancy Notice.
 - 7. Structural Special Inspection Schedule.
 - 8. Wind Force Resisting Structure.
 - 9. Seismic Force Resisting Structure.
- C. Special inspections shall be approved by the building official.
- D. Duties and Responsibilities of the special Inspector.
 - 1. Signify presence at jobsite. Special inspectors should notify Contractor personnel of their presence and responsibilities at the jobsite. If required by the building official, they shall sign in on the appropriate form posted with the building permit.
 - 2. Observe assigned work. The special inspector shall observe assigned work for conformance with the building department approved (stamped) design drawings and specifications and applicable workmanship provisions of the *International Building Code*. Architect/Engineer-reviewed shop drawings may be used only as an aid to inspection.

For continuous special inspection, the special inspector shall be on site at all times observing the work requiring special inspection. Periodic inspections, if any, must have prior approval based on a separate written plan reviewed and approved by the building department and the registered design professional in responsible charge. Periodic inspection is intended to mean that the inspector at period times inspects all work performed but is not required to "witness" the work being performed.
 - 3. Report nonconforming items. The special inspector shall bring nonconforming items to the immediate attention of the Contractor and note

all such items in the daily report. If any item is not resolved in a timely manner or is about to be incorporated in the work, the special inspector shall immediately notify the building department by telephone or in person, notify the registered design professional in responsible charge and post a discrepancy notice.

4. Provide timely reports. The special inspector should complete written inspection reports for each inspection visit and provide the reports on a timely basis determined by the building official. The special inspector or inspection agency shall furnish these reports directly to the building official, registered design professional in responsible charge and others as designated (See IBC Section 1704.1.2). These reports should be organized on a daily format and may be submitted weekly at the option of the building official. These reports should include:
 - a. Description of daily inspections and tests made with applicable locations;
 - b. Listing of all nonconforming items;
 - c. Report on how nonconforming items were resolved or unresolved as applicable; and
 - d. Itemized changes authorized by the architect, engineer, and building official if not included in nonconforming items.
5. Submit final report. The special inspector or inspection agency shall submit a final signed report to the building official stating that all items requiring special inspection and testing were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the *International Building Code*. Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous were required, etc.) shall be specifically itemized in this report.

E. Contractor Responsibilities

1. Notify the special inspector. The Contractor is responsible for notifying the special inspector or agency regarding individual inspections for items listed on the attached schedule and as noted on the building department approved plans. Adequate notice shall be provided so the special inspector has time to become familiar with the project.
2. Provide access to approved plans. The Contractor is responsible for providing the special inspector access to approved plans.
3. Retain special inspection records. The Contractor is also responsible for retaining at the jobsite all special inspection records completed by the special inspector upon request.

STRUCTURAL SPECIAL INSPECTION SCHEDULE VERIFICATION AND INSPECTION OF FABRICATORS

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	Agent
		Continuous	Periodic			
1. Applicable Element (Fabricator Certification Requirements)	Yes		X		1704.2 1704.3 1704.6	
A. Structural Steel (AISC Certified For Conventional Steel Building) B. Steel Joists/ Joist Girders (SJI Member) C. Steel Roof Deck (SDI Member) D. Precast Concrete Wall Panels (PCI Group C Manufacturer with C3 Certification) E. Load Bearing Concrete Masonry (NCMA Member)						
2. When Special Inspections Are Required By The Building Official:	Yes		X			
A. Fabrication And Implementation Procedure: The Special Inspector Shall Verify That The Fabricator Maintains Detailed Fabrication And Quality Control Procedures That Provide A Basis For Inspection, Control Of The Workmanship, And The Fabricator's Ability To Conform To Approved Construction Documents And Referenced Standards. The Special Inspector Shall Review The Procedures For Completeness And Adequacy Relative To The Code Requirements For The Fabricator's Scope Of Work.						
3. When Special Inspections Are Not Required By The Building Official:	Yes		X			
A. Upon Completion Of Fabrication, The Approved Fabricator Shall Submit A Certificate Of The Compliance To The Building Official Stating That The Work Was Performed In Accordance With The Approved Construction Documents.						

STRUCTURAL SPECIAL INSPECTION SCHEDULE

VERIFICATION AND INSPECTION OF SOILS

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Continuous	Periodic			
Verify materials below footings are adequate to achieve the design bearing capacity.	Yes		X	Geotech. Report	1704.7	
Verify excavations are extended to proper depth and have reached proper materials.	Yes		X		1704.7	
Perform classification and testing of controlled fill materials.	Yes		X		1704.7	
Verify use of proper materials, densities and lift thickness during placement and compaction of controlled fill.	Yes	X			1704.7	
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.	Yes		X		1704.7	

STRUCTURAL SPECIAL INSPECTION SCHEDULE

VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Cont.	Periodic			
Inspection of reinforcing steel, including prestressing tendons, and placement.	Yes		X	ACI 318:3.5, 7.1-7.7	1913.4	
Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5b.	Yes			AWS D1.4 ACI 318: 3.5.2		
Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	Yes	X			1911.5	
Verifying use of required design mix.	Yes		X	ACI 318:Ch.4, 5.2-5.4	1904.2.2, 1913.2, 1913.3	
At the time fresh concrete is sampled to fabricate specimens for strength tests perform slump and air content tests, and determine the temperature of the concrete.	Yes	X		ASTM C 172, ASTM C 31, ACI 318: 5.6, 5.8	1913.10	
Inspection of concrete and shotcrete placement for proper application techniques.	Yes	X		ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8	
Inspection for maintenance of specified curing temperature and techniques.	Yes		X	ACI 318: 5.11-5.13	1913.9	
Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	No	X X		ACI 318: 18.20, ACI 318: 18.18.4		
Erection of precast concrete members.	No		X	ACI 318: Ch. 16		
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	No		X	ACI 318: 6.2		
Inspect formwork for shape, location and dimensions of the concrete member being formed	No		X	ACI 318: 6.1.1		

STRUCTURAL SPECIAL INSPECTION SCHEDULE

VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION-TABLE 1

Verification and Inspection Task		Applicable To Project?	Frequency		Referenced Standard	Code Reference	
			Cont.	Periodic			
1. Material verification of high-strength bolts, nuts and washers:							
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		Yes		X	Applicable ASTM material specifications; AISC 360, Section A3.3		
b. Manufacturer's certificate of compliance required.		Yes		X			
2. Inspection of high-strength bolting:							
a. Bearing-type connections.		Yes		X	AISC 360, Section M2.5	1704.3.3	
b. Slip-critical connections.		Yes	X	X			
3. Material verification of structural steel:							
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		Yes			ASTM A 6 or ASTM A 568	1708.4	
b. Manufacturer's certified mill test reports.		Yes			ASTM A.6 or ASTM A 568		
4. Material verification of weld filler materials:							
a. Identification markings to conform to AWS specification in the approved construction documents.		Yes			AISC 360, Section A3.5		
b. Manufacturer's certificate of compliance required.		Yes					

STRUCTURAL SPECIAL INSPECTION SCHEDULE

VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION-TABLE 2

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Cont.	Periodic			
5. Inspection of welding:						
a. Structural steel:						
1) Complete and partial penetration groove welds.	Yes	X		AWS D1.1	1704.3.1	
2) Multipass fillet welds.	Yes	X				
3) Single-pass fillet welds > 5/16"	Yes	X				
4) Single-pass fillet welds ≤ 5/16"	Yes		X			
5) Floor and roof deck welds.	Yes		X	AWS D1.3		
b. Reinforcing steel:				AWS D1.4, ACI 318: 3.5.2		
1) Verification of weldability of reinforcing steel other than ASTM A 706.	No		X			
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	No	X				
3) Shear reinforcement.	No	X				
4) Other reinforcing steel.	No		X			
6. Inspection of steel frame joint details for compliance with approved construction documents:			X		1704.3.2	
a. Details such as bracing and stiffening.	Yes					
b. Member locations.	Yes					
c. Application of joint details at each connection.	Yes					

STRUCTURAL SPECIAL INSPECTION SCHEDULE
VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION - LEVEL 1
TABLE 1

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Continuous	Periodic			
1. As masonry construction begins, the following shall be verified to ensure compliance:						
a. Proportions of site-prepared mortar.	Yes		X	ACI 530.A Art. 2.6A		
b. Construction of mortar joints.	Yes		X	ACI 530.1 Art. 3.3B		
c. Location of reinforcement, connectors, prestressing tendons and anchorages.	No		X	ACI 530.1 Art. 3.4, 3.6A		
d. Prestressing technique.	No		X	ACI 530.1 Art. 3.6B		
e. Grade and size of prestressing tendons and anchorages.	No		X	ACI 530.1 Art. 2.4B, 2.4H		
2. The inspection program shall verify:						
a. Size and location of structural elements.	Yes		X	ACI 530.1 Art. 3.3G		
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	Yes		X	ACI 530 Sec. 1.2.2(e), 2.1.4, 3.1.6		
c. Specified size, grade and type of reinforcement.	Yes		X	ACI 530 Sec. 1.13, ACI 530.1 Art. 2.4, 3.4		
d. Welding of reinforcing bars.	No	X		ACI 530 Sec. 2.1 10.7.2, 3.3.3.4(b)		
e. Protection of masonry during cold weather (temperature below 40 °F) or hot weather (temperature above 90 °F).	Yes		X	ACI 530.1 Art. 1.8C, 1.8D	Sec 2104.3, 2104.4	
f. Application and measurement of prestressing force.	No		X	ACI 530.1 Art. 3.6B		

STRUCTURAL SPECIAL INSPECTION SCHEDULE
VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION - LEVEL 1
TABLE 2

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Continuous	Periodic			
3. Prior to grouting, the following shall be verified to ensure compliance:						
a. Grout space is clean.	Yes		X	ACI 530.1 Art. 3.2D		
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.	Yes		X	ACI 530 Sec. 1.13, ACI 530.1 Art. 3.4		
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.	Yes		X	ACI 530.1 Art. 2.6B		
d. Construction of mortar joints.	Yes		X	ACI 530.1 Art. 3.3B		
4. Grout placement shall be verified to ensure compliance with code and construction document provisions.	Yes	X		ACI 530.1 Art 3.5		
a. Grouting of prestressing bonded tendons.	No	X		ACI 530.1 Art. 3.6C		
5. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	Yes	X		ACI 530.1 Art. 1.4	Sec 2105.2.2, 2105.3	
6. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Yes		X	ACI 530.1 Art. 1.5		

STRUCTURAL SPECIAL INSPECTION SCHEDULE

VERIFICATION AND INSPECTION OF WIND RESISTANCE

APPLICABLE ONLY TO THE "TRAINING ROOM"

Verification and Inspection Task		Applicable To Project?	Frequency		Referenced Standard	Code Reference	
			Cont.	Periodic			
Roof cladding and roof framing connections.		Yes		X		1705.4	
Wall connections to roof and floor diaphragms and framing.		Yes		X		1705.4	
Roof and floor diaphragm systems, including collectors, drag struts and boundary elements.		Yes		X		1705.4	
Vertical wind force-resisting systems, including braced frames, moment frames and shear walls.		Yes		X		1705.4	
Wind force-resisting system connections to the foundation.		Yes		X		1705.4	
Fabrication and installation of systems or components required to meet the impact-resistant requirements of IBC Section 1609.1.2.		Yes		X		1705.4	

WIND FORCE RESISTING STRUCTURE

Section 1705.4 of the *International Building Code* states that special inspection shall include wind requirements for structures constructed in the following areas:

1. In wind Exposure Category B, where the 3-second-gust basic wind speed is 120 mph or greater.
2. In wind Exposure Category C or D, where the 3-second -gust basic wind speed is 110 mph or greater.

The following chart identifies the main windforce-resisting system elements to facilitate the structural observations, special inspections and testing. Per Section 1706 of the *International Building Code* each contractor or subcontractor responsible for the construction of a main windforce-resisting element listed below shall submit a written statement of responsibility as defined in Section 1706.1 to the building official and the owner prior to the commencement of work. Special Inspections shall be performed in accordance with the structural special inspection schedule and construction documents.

Prior to structural observations, the contractor shall notify Spencer-Engineers, Inc., prior to the construction of the following items deemed part of the windforce-resisting system. Spencer-Engineers, Inc., will make structural observations at significant construction stages and at the completion of the structural system.

Wind Force Resisting Elements		
Foundation		
Shallow Foundations		Shallow Foundations which support members of the wind force-resisting system
Vertical		
CMU Shear Walls		CMU Walls as indicated on the Drawings.
Horizontal		
Roof Diaphragms		Structural metal roof decks which are supported by members of the WFRS
Slab on Grade		All slabs supported by grade

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements, duties, and responsibilities of the testing agency and the Contractor. Refer to individual specification sections for required testing under each section.

1.2 CONTRACTOR REQUIREMENTS

- A. The Contractor shall employ and pay for the services of an independent laboratory to perform specified services. Employment of a testing laboratory shall in no way relieve contractor of his obligation to perform work in accordance with the contract.

1.3 TESTING AGENCY QUALIFICATIONS

- A. The testing agency shall meet or exceed all published requirements as recommended by, ACIL, American Council of Independent Laboratories.
- B. The testing agency shall be an NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- C. The testing agency shall meet requirements of ASTM E 329, "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing".
- D. The testing agency shall perform all testing under the direction of a registered professional engineer employed full time by the testing laboratory.

1.4 SUBMITTALS

- A. Submit name of testing agency to the Architect for approval.
- B. Submit qualifications of testing agency and evidence laboratory meets specifications.
- C. Submit copy of report of inspection of facilities made by materials reference laboratory of National Bureau of Standards of any deficiencies reported by inspection
- D. Submit list of each material, product, or area of work to be tested with related specification section for approval.

1.5 TESTING AGENCY DUTIES

- A. Cooperate with Architect and Contractor to promptly provide qualified personnel. Perform specified inspections, sampling and testing of materials and methods of construction to ascertain compliance with requirements of contract

documents. Promptly notify Architect and Contractor of irregularities or deficiencies of work observed during performance of services.

B. Promptly prepare reports of inspections and tests including:

1. Date issued
2. Project title and number
3. Testing laboratory, name and address
4. Name and signature of inspector
5. Date of inspection or sampling
6. Record of temperature and weather
7. Date of test
8. Identification of product and specification section
9. Location of project
10. Type of inspection or test
11. Observations regarding compliance with contract documents requirements

C. Promptly distribute copies of reports of inspections and tests to:

1. Owner
2. Architect
3. Consulting Engineer, when pertinent
4. General Contractor
5. Subcontractor, when pertinent

1.6 CONTRACTOR RESPONSIBILITIES

- A. Provide detailed list, type and schedule in writing of all testing, required to testing laboratory at beginning of project. Provide adequate notice for each test, and schedule laboratory accordingly. No delay or extension of time will be allowed due to lack of timely notices or inadequate scheduling.
- B. Cooperate with laboratory personnel to provide access to work and to manufacturer's operation. Provide to laboratory, in required quantities, preliminary representative samples of materials to be tested. When required, furnish copies of mill test reports. Furnish to laboratory, casual labor to obtain and handle samples at the site and to facilitate inspections and tests. Provide facilities for laboratory's exclusive use for storage and curing of test samples. Notify laboratory sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests.
- C. Arrange and pay for additional samples and tests required for contractor's convenience. When initial tests indicate work does not comply with contract documents, the Contractor may employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Work required under this Section consists of temporary construction facilities, services, and related items to complete the work indicated on the drawings and described in the specifications.
- B. Specific administrative and procedural minimum actions are specified in this Section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication by Architect or Engineer that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this Section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

1.2 QUALITY ASSURANCE

- A. In addition to compliance with governing regulations and rules/recommendations of franchised utility companies, comply with specific requirements indicated and with applicable local industry standards for construction work (published recommendations by local consensus "building councils").
- B. ANSI Standards: Comply with applicable provisions of ANSI A10-Series standards on construction safety.
- C. NFPA Code: Comply with NFPA Code 241 "Building Construction and Demolition Operations".
- D. In compliance with Owner's policy on energy/materials conservation, install and operate temporary facilities and perform construction activities in manner which reasonably will be conservative and avoid waste of energy and materials including water.

1.3 JOB CONDITIONS

- A. Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.
- B. Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, nonhazardous, sanitary and protective of persons and property, and free of deleterious effects.

1.4 FURNISHING AND MAINTENANCE OF EQUIPMENT

- A. Contractor shall furnish and maintain all equipment such as temporary stairs, ladders, ramps, scaffolds, hoists, runways, derricks, chutes, elevators, etc. as required for proper execution of the work of all trades. All such apparatus, equipment and construction shall meet all the requirements of the Labor Law and other State or local laws applicable thereto.

1.5 TEMPORARY UTILITY SERVICES

- A. General: The types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, connect to existing franchised utilities for required services; and comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services as necessary to minimize interference with construction operations.
- B. Potable Water: Costs of water connection, meters and utilities shall be by the Contractor.
- C. Sewer Sediment: Prior to start of work at project site, engage an independent sewer inspection service to measure existing levels of sediment in sewers, and to provide recommendations for minimizing entrance of sediment and polluting substances during construction. At time of substantial completion on elements of work affecting inflow of sewage, check sediment levels and submit report recording changes in condition of sediment. Clean sewers where level has increased significantly. Maintain sewers and temporary connecting sewers in a reasonably clean, nonclogged condition during construction period.
- D. Temporary Power: Provide temporary service as required with ground-fault circuit interrupter features, activated from each circuit of 20-amp or less rating.
- E. Metering: Provide meter for electrical power. Costs of electrical connection, service and utilities shall be by the Contractor.

1.6 TEMPORARY CONSTRUCTION FACILITIES

- A. General: The types of temporary construction facilities required include, but not by way of limitation, water service and distribution, drainage, dewatering equipment, enclosure of work, heat, ventilation, telephone service, sanitary facilities, drinking water, storm and sanitary sewer, electrical power distribution, lighting, hoisting facilities, stairs, and ladders. Provide facilities reasonably required to perform construction operations properly and adequately.
- B. Water Distribution: Provide hose length sufficient to reach entire area of construction work, not less than 3/4 inch hose size. Prevent freezing of water distribution by either prompt drainage after each use, or by suitable protection. Maintain 30 psi minimum water pressure at hose outlets, by temporary pumping where necessary.

- C. Enclosure: Provide temporary enclosure where indicated and where reasonably required to ensure adequate workmanship and protection from weather and unsatisfactory ambient conditions for the work, including enclosure where temporary heat is used. Provide fire-retardant treated lumber and plywood. Provide tarpaulins with UL label and flame spread of 15 or less, complying with NFPA 701. Provide translucent type tarpaulins (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.
- D. Heating: Use natural gas from piped distribution system where available. Where piped gas is not available, heat with self-contained LP gas or fuel oil heaters, bearing UL, FM or other approval labels appropriate for application. Vent fuel-burning heaters and equip units with individual-space thermostatic controls. Use electric-resistance space heaters only where no other, more energy-efficient, type of heater is available and allowable.
- E. Electrical Power: Provide weatherproof, grounded, power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, lighting, and start-up testing of permanent electric-powered equipment prior to its permanent connection to electrical system. Provide overload protection. Locate multiple outlets (not less than 4 gang) at each story (where occurs) of construction, spaced so that entire area of construction can be reached by power tools on a single extension cord of 100 feet maximum length. Supply power for electric welding, if any, from either temporary power distribution system or by engine-driven power generator sets, at Contractor's option.
- F. Lighting: Provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting. Provide general lighting with local switching which will enable energy conservation during period of varying activity (work-in-progress, traffic only, security check, lockup, etc.). Provide uniformly spaced general lighting equivalent to not less than 200 watt incandescent lamp per 1000 square feet of floor area, and one 100 watt lamp per 50 feet of corridor and per flight of stairs.
- G. Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections.
- H. Roads: Access to and from the construction site shall be as approved by the Owner. Existing drives shall be inspected by the Owner, Architect and Contractor prior to use for construction and conditions noted, including photographic documentation. The Contractor shall repair or resurface the road at the end of the Project to at least the condition observed before the Project began. The Contractor shall be responsible for keeping the road free from construction debris, mud, and other encumbrance on a daily basis to prevent hazards to Owner's employees or visitors.

1.7 SECURITY/PROTECTION PROVISIONS

- A. General: The types of temporary security and protection provisions required include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, sidewalk bridges, building enclosure/lockup, watchman service, personnel security program for theft prevention, environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site.
- B. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Provide Type A extinguishers at locations of low potential for either electrical or grease/oil flammable liquids fires. Provide Type ABC dry chemical extinguishers at other locations. Comply with recommendations of NFPA No. 10. Post warning and quick-instructions at each extinguisher location, and instruct personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site. Post local fire department call number on each telephone instrument at project site.
- C. Building Enclosure and Lockup: At earliest possible date, secure building against unauthorized entrance at times when personnel are not working. Provide secure temporary enclosures at ground floor and other locations of possible entry, with locked entrance.
- D. Environmental Protection Procedures: Provide facilities, establish procedures, and conduct construction activities in a manner which will ensure compliance with Owner's environmental impact statement and other regulations controlling construction activities at project site. Designate one person, the Construction Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air/water/soil, generation of noise, and similar harmful or deleterious effects which might violate regulations or reasonably irritate persons at or in vicinity of project site.
- E. Keep all fume or odor generating devices away from existing facility HVAC air intakes or open windows.
- F. The Contractor shall provide pumps as required to keep the excavation free from standing water and shall slope the excavation to prevent water from running toward existing buildings at all times.

1.8 TEMPORARY SUPPORT FACILITIES

- A. General: The types of temporary support facilities required include, but not by way of limitation, field offices, storage sheds, fabrication sheds, sanitary facilities, drinking water, first aid facilities, bulletin board, private and public telephones, clocks, thermometer, project identification signs, clean-up facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including owner's and Architect's/Engineer's personnel. Discontinue and remove temporary support

facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by Architect/Engineer' and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.

- B. Contractor's Field Office: Provide trailer for contractor's field office on site with adequate space for field office personnel plus one spare work station for incidental use by subcontractor's personnel, suitably finished, furnished, equipped and air conditioned. Trailer shall include adequate conference room space for OAC meetings with sub-contractors. Provide adequate tack-board space for posting of notices, progress schedule and similar information. Provide shelf and file space adequate for storage of approved samples and shop drawings. Provide toilet located in field office with water closet, lavatory, mirror, toilet paper holder, and paper towel dispenser. Power and water to field office shall be provided by contractor from temporary service. Sanitary waste shall be self contained holding facility maintained by contractor. Contractor shall provide for telephone service to field office. Contractor shall provide computer in field office and shall establish an on site email address. See drawings for location of contractor's field office.
- C. Sanitary Facilities: At Contractor's option, provide either piped (wet) toilet facilities or self-contained toilet units of type acceptable to governing authorities, adequate (at all stages of construction) for use of personnel at project site. Provide separate facilities for male and female personnel when both sexes are working (in any capacity) at project site. provide piped (wet) wash facilities with hot water; except, during time when only earthwork and foundation work are in progress, wash facilities may be limited to wet-type paper hand towels.
- D. Drinking Water: Provide dispenser-type, cold drinking water units, either piped with potable water or supplied with bottled water; adequate in number and locations for personnel at project site. Furnish paper cups and waste receptacles.
- E. Yard Storage, Storage Trailers, field offices, and any other facilities shall be inside the fenced construction area.
- F. Project Sign: One (1) project sign will be required for this project. Refer to Section 01580, Project Identification and Signs. No other individual signs of the contractor, any subcontractor, or any other entity will be allowed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for Project Identification signs and other signs to be used during the work of this project.

1.2 QUALITY ASSURANCE

- A. Construction and installation of signs shall conform to applicable codes, laws, and regulatory agencies.
- B. Signs shall be prepared by a professional sign manufacturer with a minimum of five (5) years experience in the preparation of signs similar to those required for this project.
- C. Sign lettering and backgrounds shall be adequate to resist weathering and fading for the scheduled construction period.

1.3 SUBMITTALS

- A. Submit shop drawing for each sign indicating fabrication of sign and supports, information on each sign, sign media, lettering, and graphics. Do not start sign fabrication until shop drawing has been reviewed by Architect.
- B. Submit qualifications of sign manufacturer.

1.4 SIGN RESTRICTIONS

- A. Signs on the project site shall be limited to those specified in this Section. No other individual signs of the contractor, any subcontractor, supplier or vendor or any other entity will be allowed on site.

PART 2 PRODUCTS**2.1 PROJECT IDENTIFICATION SIGN**

- A. The design layout of the Project Identification Signs will be furnished by the Architect for the sign maker to use to prepare the design. Design layout provided will not be camera ready artwork. Camera ready design will be the responsibility of the sign maker. Project sign will contain relevant project information, including project title, owner, Architect and Contractor. Sign will be printed in multiple colors as determined by the Architect. Install project sign on treated posts adequate to support the sign. Locate sign as directed by Architect.
- B. Project Identification sign shall consist of two separate signs approximately 4 feet x 8 feet in size.

2.2 SIGN MATERIALS

- A. Structure and framing shall be new material in sound condition, structurally adequate to support the work and resist wind loads, and suitable for specified finish. Wood products and sign fabrication shall comply with Section 06200 - Rough Carpentry.
- B. Project Identification and other signs shall be constructed of 3/4 inch MDO

exterior grade plywood with continuous vinyl edge band and 1x2, FAS, cedar trim border.

- C. Vinyl for lettering and graphics shall be equal to 3M High Performance Vinyl.
- D. Painting material shall be as specified in Section 09900 - Painting.

PART 3 EXECUTION

3.1 PROJECT IDENTIFICATION SIGN

- A. Paint all exposed surfaces of supports, framing, and surface material with one coat of primer and two coats of exterior paint.
- B. Protect the finished surface where required with at least three coats of clear, waterproof, matte acrylic finish sufficiently durable to last for the entire construction period.
- C. Unless otherwise indicated, mount sign at least 4 feet above the grade to the bottom. Install where directed by Architect.

3.2 INFORMATIONAL SIGNS

- A. Paint all exposed surfaces with one coat of primer and one coat of exterior paint.
- B. Apply graphics in the styles, sizes, and colors as selected by Architect.
- C. Install at a height for optimum visibility and as directed by Architect.

3.3 MAINTENANCE

- A. Maintain signs and supports in a neat, clean condition. Repair damages to structure, framing, or sign. Repair/re-paint damaged or faded signs when directed by Architect.
- B. Relocate informational signs as required by progress of the work.

3.4 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of project.

3.5 ATTACHED EXHIBITS

- A. See Exhibits "A" and "B" attached to the end of this Section.

END OF SECTION

Project Sign

4'x6'

PROGRAM NAME (CDBG Program)
Project Name
Local Unit of Government



GOVERNOR PHIL BRYANT
STATE OF MISSISSIPPI
MISSISSIPPI DEVELOPMENT AUTHORITY
Glenn McCullough, Jr., Executive Director

CHIEF ELECTED OFFICIAL / EXECUTIVE, TITLE
BOARD MEMBERS
Board Member One
Board Member Two
Board Member Three
Board Member Four
Board Member Five

U.S. Department of Housing and Urban Development



Exhibit B
to Section 01580 Project Identification and Signs

CDBG PROJECT SIGN

TO: Local Units of Government, Contractors, and Other Interested Parties

SUBJECT: PROJECT SIGN REQUIRED BY COMMUNITY SERVICES DIVISION,
MISSISSIPPI DEVELOPMENT AUTHORITY. POLICY STATEMENT
#04-001

The Project Sign shall be installed when construction begins and shall remain in place throughout the project activity period. The sign shall be placed at the entrance of the project site. The sign shall be waterproof and shall have a background of red, white and blue in three segments, and shall be 4 feet by 6 feet.

The Project Sign shall include the following information as shown on the attached example.

1. Program Name: COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM
2. Project Name: DESCRIPTION OF PROJECT
3. Local Unit of Government: TOWN, CITY OR COUNTY
4. Grantor Agency: GOVERNOR PHIL BRYANT, STATE OF MISSISSIPPI,
MISSISSIPPI DEVELOPMENT AUTHORITY, GLEN McCULLOUGH, JR.
EXECUTIVE DIRECTOR.
5. Local Officials Names: CHIEF ELECTED OFFICIAL AND BOARD MEMBERS
6. U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Purchase of the Project Sign shall be an allowable expenditure under the CDBG Program, and should be included in the bid proposal for all CDBG construction contracts.

Inquiries or comments concerning this Policy Statement should be directed to Community Services Division, MDA at 601-359-3179.

Attachment (Sign Illustration Page)

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes administrative requirements to set forth the procedure and conditions for:
 - 1. Submitting list of products proposed for installation.
 - 2. Providing products equal to those specified.
 - 3. Requesting substitutions of products and construction methods to those specified.

1.2 DEFINITIONS

- A. Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
- B. Equal Product: Product option that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.3 SUBMITTAL OF PRODUCT LIST

- A. Within thirty (30) days after date of Notice to Proceed, submit to the Architect two (2) copies of complete list of products which are proposed for installation.
- B. Tabulate list of products by their respective specification section number.
- C. Include with listing of each product:
 - 1. Name and address of product manufacturer
 - 2. Trade name of product
 - 3. Model or catalog designation of product
- D. Actions of the Architect:
 - 1. The Architect will promptly review Product List and reply in writing to the Contractor stating any reasonable objections to the Product List. If inadequate data on any proposed product is not submitted, the Architect

may elect to defer any action on the substitution until the Contractor provides further data or may reject the proposed product. Failure to object to a product shall not constitute a waiver of any of the requirements of the Contract Documents.

2. Upon Architects approval of the Product List the contractor shall not change proposed products.

1.4 PRODUCT OPTIONS

- A. Architect will not consider requests for equal products during bidding.
- B. For products specified only by reference standards, select a product meeting those standards.
- C. For products specified by naming a product and listing a minimum of two (2) additional manufacturers of equal products, select an product equal to the product specified by one of the manufacturers named.
- D. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or equal" after specified product, Contractor shall submit the following:
 1. Statement from Contractor stating that product has been thoroughly reviewed and is equal to the product specified.
 2. Complete data substantiating compliance of proposed equal product with contract documents.
 3. Product identification including manufacturer's name and address.
 4. Manufacturer's literature, product description, performance and test data and reference standards.
 5. Data that is required under the submittal article of the specification section for that product.
- E. For products specified by naming only one product and manufacturer and stating no product options will be accepted, there is no option and no request for comparable products will be allowed.
- F. Actions of the Architect
 1. The Architect will promptly review a proposed equal product request where equal products are allowed by requirements of respective specification section and reply in writing to the Contractor stating if product is approved or rejected. If Contractor fails to submit adequate data on any proposed equal product, the Architect will reject the proposed product.
 - a. See related requirements in Section 01340 - Shop Drawings, Product Data, and Samples

1.5 SUBSTITUTIONS

- A. Architect will not consider requests for substitutions during bidding.
- B. Within thirty (30) days after date of Notice to Proceed, Architect will consider formal requests from Contractor for substitutions in place of those specified. Submit five (5) copies of request for substitution. Include in request:
 - 1. Statement indicating why specified product or fabrication or installation cannot be provided.
 - 2. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - 3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - 4. Complete data substantiating compliance of proposed substitutions with contract documents.
 - 5. For products:
 - a. Product identification including manufacturer's name and address.
 - b. Manufacturer's literature: Product description, performance and test data and reference standards.
 - c. Samples of proposed substitution
 - d. Name and address of similar projects on which product was used and date of installation.
 - 6. For construction methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 - 7. Itemized comparison of proposed substitution with product or method specified.
 - 8. Data relating to changes in construction schedule.
 - 9. Accurate cost data on proposed substitution in comparison with product or method specified.

- C. In making request for substitution, Contractor represents:
1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
 2. He will provide the same guarantee for substitution as for product or method specified.
 3. He will coordinate installation of accepted substitution into work, making such changes required of work to be complete in all respects.
 4. He waives all claims for additional costs related to substitution which consequently becomes apparent.
 5. He waives all rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 6. Cost data is complete and includes all related costs under his contract.
- D. Substitutions will not be considered if:
1. Substitution is for contractor convenience due to delays in ordering products or materials.
 2. Submitted after the date stipulated.
 3. They are indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this section.
 4. Acceptance will require substantial revision of contract documents.
 5. Acceptance will require any coordination or additional time of the Architect.
 6. Acceptance will require additional time to the schedule.
 7. Acceptance will affect installation of Owner installed or provided work.
 8. In the Architect's judgement, the product, material, or construction method is not equal to that indicated. The decision of the Architect will be final.
- E. Actions of the Architect
1. The Architect will promptly review a substitution request and reply in writing to the Contractor stating any reasonable objections to such proposal. If inadequate data on any proposed product substitution, construction method substitution is not submitted, the Architect may elect to defer any action on the substitution until the Contractor provides

further data or may reject the substitution request. Failure to object to a product substitution or construction method substitution shall not constitute a waiver of any of the requirements of the Contract Documents.

2. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

PART 2 EXECUTION - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for final inspections, submitting of all closeout documents and related items to complete the work indicated on the drawings and described in the project manual.
- B. Project Record Documents are separate from Project Closeout Documents and are to be submitted in accordance with Section 01720 prior to the request for the Architect's inspection to determine Substantial Completion.

1.2 PROJECT CLOSEOUT MEETING

- A. A project closeout meeting shall be held at least thirty (30) days prior to the date the substantial completion is scheduled to occur, with the Contractor and all his sub-contractors and the Architect and his consultants and the owners representative present. The agenda shall include but shall not be limited to a review of this Section and the related requirements for project closeout, substantial completion and project record documents, and the requirements to be met prior to application for final payment. Attendance by the Contractor and sub-contractors shall be mandatory. Meeting shall be held by the Contractor and shall be conducted in accordance with Section 01200, Project Meetings.

1.3 FINAL INSPECTIONS

- A. Contractor's List of Items to be Completed or Corrected: When the Contractor considers the Work or designated portion thereof which the Owner agrees to accept separately, is substantially complete in accordance with Paragraph 9.8 in Section 00800, the Contractor shall prepare and submit to the Architect a comprehensive "punch" list of items to be completed or corrected. This comprehensive list shall be typed, separated by sitework, exterior and interior work, and include all spaces, rooms and areas, and cover all components and disciplines, including testing, certifications and documentation required. The Contractor shall proceed promptly to complete and correct all items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the contract documents.
- B. Architect's Inspection: The Contractor shall make written request for a final inspection to the Architect at least ten (10) days prior to the date the inspection is requested. Upon receipt of this request, the Contractor's list and the Project Record Documents, the Architect will make an initial first inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the contract documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct all such items upon notification by the Architect. The Contractor shall then submit a request for a second

inspection by the Architect to determine Substantial Completion. The Contractor shall promptly complete or correct the items on this list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the contract documents. If, in his judgement, the project is not ready for a final inspection, the Architect may postpone the inspection until the items on the previous list are complete.

- C. Owner's Inspection: Prior to the project or designated portion thereof being ascertained to be Substantially Complete, an inspection will be scheduled with the Owner and the Architect in conjunction with the above Architect's inspections to review the Work or designated portion thereof. When the Owner and the Architect agree the Owner has been properly instructed on matters relating to the project and all documents have been submitted in accordance with all requirements within this Section and Section 01720 - Project Record Documents, and the Work or designated portion thereof has been determined to be complete, a Certificate of Substantial Completion shall be prepared by the Architect, which shall establish the date of Substantial Completion, shall establish responsibilities for the Owner and the Contractor, and fix the time within which the Contractor shall finish any remaining items on the list accompanying the Certificate. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of responsibilities assigned to them in such Certificate.
- D. Correction of Work before Final Payment: Contractor shall promptly remove from the Owner's premises, all materials condemned for failure to conform to the contract, whether incorporated in work or not, and Contractor shall, at his own expense, replace such condemned materials with those conforming to the requirements of the contract. Failure to remedy such defects after ten (10) days written notice will allow the Owner to make good such defects and such costs shall be deducted from the balance due the Contractor or charged to the Contractor in the event no payment is due.
- E. Should additional inspections by the Architect of the work be required due to failure of the Contractor to remedy defects listed, the Owner may deduct the expense of additional Architect's inspections from the contract amount in the Owner/Contractor agreement. The additional expense will be based on the rate for additional services and expenses in the Owner/Architect agreement.

1.4 CLOSEOUT DOCUMENTS

- A. Unless otherwise notified, the Contractor shall submit to the Owner through the Architect, three (3) copies of the following.
 - 1. Application for Final Payment.
 - 2. Copy of Architect's List of Items to be Completed or Corrected, and Contractor's certification on each item that final list of items have been completed or corrected.
 - 3. Contractor's Affidavit of Payment of Debts and Claims: AIA Document G706, Latest Edition, fully completed and notarized. These forms shall be executed by all subcontractors and material suppliers furnishing labor and/or materials for this Project.

4. Release of Liens and Certification that All Bills Have Been Paid: AIA Document G706A, Latest Edition, fully completed and notarized. Legally effective releases or waivers (satisfactory to Owner) of all liens arising out of or filed in connection with the Work. Contractor shall furnish receipts or releases in full and shall include all labor, services, materials and equipment for which a lien could be filed, and that all payrolls, materials and equipment bills, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied. These forms shall be executed by all subcontractors and material suppliers furnishing labor and/or materials for this Project. If any subcontractor, manufacturer, fabricator, supplier, or distributor fails to furnish a release or receipt in full, if approved by the Owner, the contractor may furnish a Bond or other collateral satisfactory to the Owner to indemnify Owner against any lien.
5. Consent of Surety Company to Final Payment: AIA Document G707, Latest Edition, fully completed and notarized in full by the bonding company. Alteration of this form by adding to or deleting from the standard form will not be an acceptable Consent of Surety to Final Payment.
6. Certificate of Insurance: A certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) days prior written notice has been given to the Owner and a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the contract documents.
7. Guarantee of Work: The Guarantee of Work shall be submitted as a separate document on the Contractor's or Surety's letterhead, signed by Contractor and Contractor's Surety and notarized, addressed to the Owner and identifying the project, and shall be worded as follows:

"Contractor and Contractor's Surety hereby guarantee that all Work is free from defective and/or nonconforming materials, workmanship or operation and that for a period of one (1) year from the date of substantial completion for such portions of the Work or such longer period of time as may be called for in the Contract Documents, Contractor or its Surety will repair and/or replace any defective and/or nonconforming materials, workmanship or operation in accordance with the requirements of the Contract Documents."

 - a. All guarantees and warranties shall be obtained in the Owner's name.

1.5 GUARANTY PERIOD

- A. Within the guaranty period, if repairs or changes are requested in connection with guaranteed work which, in the opinion of the Owner, is rendered necessary as a result of the use of materials, equipment, or workmanship which are

inferior, defective, or not in accordance with the terms of the contract, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such guaranteed work, correct all defects wherein and make good all damages to the building, site, equipment or contents thereof which, in the opinion of the Owner, is the result of the use of materials, equipment, or workmanship which are inferior, defective or not in accordance with the terms of the contract; and make good any work or materials or the equipment and contents of said buildings or site disturbed in fulfilling any such guaranty.

- B. If, after notice, the Contractor fails to proceed promptly to comply with the terms of the guaranty, the Owner may have the defects corrected and the Contractor and his sureties shall be liable for all expense incurred.
- C. All special guaranties applicable to definite parts of the work stipulated in the project manual or other papers forming part of the contract shall be subject to the terms of this paragraph during the first year of the life of such special guaranty.

1.6 ADDITIONAL DOCUMENTS

- A. Provide all additional certificates, warranties, guarantees, bonds, or documents as called for in the individual sections of the project manual. The Contractor is responsible for examining the Project Manual for these requirements.

1.7 MAINTENANCE STOCK

- A. Deliver to Owner all required additional maintenance materials as required in the various Sections of the specifications. Submit a copy of each transmittal form indicating date of delivery, project, specification section number, materials, particular dye, run or lot information, quantities and Owner's representative's name and signature of acceptance of same to the Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01710

CLEANING AND SITE MAINTENANCE

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for maintaining cleaning and site maintenance operations during construction.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

2.2 MAINTENANCE MATERIALS

- A. Use only maintenance equipment designed for the use intended. Keep mowers, sweepers, weed trimming devices, vacuums, and other site maintenance equipment in proper working order and well maintained.

PART 3 EXECUTION

3.1 GENERAL

- A. Maintain premises and public properties free of accumulations of waste, debris, dirt, dust, mud and rubbish caused by operations. Keep premises free of weeds and un-kept grass. Mow site on a regular basis. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials and clean all sight-exposed surfaces. Leave project clean and ready for occupancy.
- B. Dispose of all waste, debris and rubbish in accordance with the directions of the owner's representative and local, state and federal agencies having jurisdiction.

3.2 SITE MAINTENANCE OPERATIONS

- A. Maintain a neat and orderly site at all times during the work of this project.
- B. Provide necessary materials, equipment and crews to keep site free from excess water, ponding, accumulation of mud and insure drainage is properly controlled. Clean and remove dirt and mud on all roads, drives, parking areas, sidewalks, and similar areas on a daily basis.
- C. Keep weeds and grass trimmed and mowed. Trim along construction fences and remove weeds, vines, and other growth from fence as required to keep fence free of vegetation. Do not allow weeds and grass to grow through cracks in paving, walks, and other surfaces. Keep weeds and grass trimmed and under control around stationary equipment, pallets, cranes and other temporary construction. Do not allow trimmings and grass clippings to accumulate on site.

3.3 DAILY CLEANING OPERATIONS

- A. Execute daily cleaning to ensure that building, grounds, and public properties are maintained free of accumulations of waste materials and rubbish. Wet down exterior dry materials and rubbish to lay dust and prevent blowing dust. During progress of work, clean site and public properties and dispose of waste

materials, debris, and rubbish. Remove waste materials, debris and rubbish from site daily and legally dispose of at public or private dumping areas off owner's property. Keep walks and drives free of leaves, grass clippings, and related plant materials.

- B. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on a daily basis until building is ready for substantial completion or occupancy. Schedule cleaning operations so that dust or other contaminants resulting from cleaning process will not fall on wet or newly painted surfaces.
- C. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights. No materials may be disposed of by dumping them in the sanitary or storm sewer systems without specific approval by the Owner or authorities having jurisdiction.
- D. Keep cleaning equipment in good working order. Replace vacuum cleaner bags when full. Do not use vacuums without proper filtering. Use products and devices which are in good condition and that are adequate for, and deigned to, accomplish cleaning task for which they are used. Vacuum cleaners used in occupied areas shall have additional HEPA filters. Maintain a supply of clean unused vacuum bags and filters at site.
- E. Take all precautions required to minimize airborne dust and other contaminants inside building area. Provide for the use of air cleaning devices in work areas that generate airborne dust. Maintain air cleaner filters and clean equipment daily. Use cutting and grinding equipment with dust control devices integral with equipment to minimize the production of dust.

3.4 FINAL CLEANING OPERATIONS

- A. Employ experienced workmen or professional cleaners for final cleaning. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces and concealed spaces. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish. Repair, patch and touch up marred surfaces to specified finish to match adjacent surfaces. Broom clean paved surfaces. Rake clean other surfaces of grounds. Replace air conditioning filters if units were operated during construction. Clean ducts, blowers and coils and install filters if air conditioning units were operated without filters during construction. Maintain cleaning until project, or respective portions thereof, is occupied by Owner.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This section sets forth the minimum procedures and requirements for keeping and submitting the project record documents.

1.2 ELECTRONIC MEDIA FORMAT

- A. Project Record Documents shall be recorded as pdf's (Portable Document Format). Other document files such as tif, jpg, png or similar images are not acceptable.

1.3 RECORD DOCUMENTS

- A. The Project Record Documents shall include but not be limited to the following:
 - 1. Contract documents
 - a. Project Manual
 - b. Drawings
 - c. Addenda
 - d. Change orders and other modifications to the contract
 - 2. Value engineering log
 - 3. Requests for Information and responses
 - 4. Architect's supplemental instructions
 - 5. Approved shop drawings
 - 6. Field drawings
 - 7. Materials submittals
 - 8. Fixture submittals
 - 9. Equipment submittals
 - 10. Hardware schedules
 - 11. Field and laboratory test records

12. Equipment brochures
13. Spare parts lists
14. Operating instructions
15. Operation and Maintenance manuals
16. Certificates
17. Warranties
18. Guarantees
19. Bonds
20. Subcontractor list
21. Construction photographs
22. Other documents as called for in the individual sections of the project manual.
23. Sufficient information, such as-built control drawings for air handling system and variable drive controls, shall be furnished to allow qualified personnel to service equipment.

B. The Project Record Documents shall include Operation and Maintenance Instructions. Arrange for each installer of equipment that requires regular maintenance to meet with the owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals
2. Record documents
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification systems
8. Control sequences
9. Hazards

10. Cleaning
 11. Warranties and bonds
 12. Maintenance agreements and similar continuing commitments
- C. The Project Record Documents shall include, as part of instructions for operating equipment, a demonstration of the following procedures:
1. Startup
 2. Shutdown
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedure.
 6. Economy and efficiency adjustments
 7. Effective energy utilization
- D. The Project Record Documents shall include a record of the review of operation and maintenance instructions and instructions for operating equipment, indicating date, time and attendance for each item.
- E. The contractor shall schedule a meeting with the Owner to review each component of the Project Record Documents.

1.4 MAINTENANCE OF DOCUMENTS

- A. Maintain one copy of all contract drawings, project manual, addenda, change orders, review shop drawings, review submittals, hardware schedules, field and laboratory test records, equipment brochures, parts lists, operating instructions and other modifications to the contract.
- B. Stamp in large, printed red letters on the outside of each document "PROJECT RECORD DOCUMENTS".
- C. Store documents apart from documents used for construction.
- D. Maintain documents in clean, dry, and legible condition. Do not use record documents for construction purposes.
- E. Make documents available at all times for inspection by the Architect and Owner. Documents shall be available for review at the Project Site.
- F. Maintain a "RECORD DOCUMENTS LOG" listing all changes and modifications and date these items that will be incorporated into the Project Record Documents.

1.5 RECORDING

- A. General: Mark all modifications in red ink or pencil, or appropriate electronic notes indicated in red. Keep record documents current. Review log at progress meetings. Do not permanently conceal any work until required information has been accurately recorded.
- B. Legibly mark Contract Drawings to record actual construction including but not limited to the following:
 - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - 3. Field changes of dimension and detail.
 - 4. Changes made by change order or field order.
- C. Legibly mark up each section of the Specifications to record manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed. Accurately record information in the Project Manual changed by Addenda prior to execution of Contract. Accurately record information changed by change order, construction change directive and field directed minor changes in the work in the Project manual.
- D. Maintain Shop Drawings as record documents. Legibly mark drawings to record changes made after review.

1.6 SUBMITTALS

- A. The Contractor shall furnish two (2) complete copies of the project record documents and project record documents log on compact discs in Portable Document Format (PDF).
 - 1. Each major subcontractor including but not limited to Mechanical, Electrical, Communications, and Controls shall provide copies to the Contractor for submittal.
 - 2. The record documents shall be divided into categorized electronic folders including but not limited to the following: Drawings, Specifications, Addenda, Changes, RFI's, Submittals, Laboratory Tests, Manuals, Warranties, and Bonds.
 - 3. Record drawings shall be assembled into one complete set of drawings to include all disciplines including but not limited to architectural, civil, landscape, structural, mechanical, and electrical, and properly organized and enumerated.
 - 4. List, indexes, table of contents or similar organization shall be included

for referencing location of documents within the electronic submittal.

5. Within the PDF files, information shall be arranged by specification section number and shall include an index and be catalogued with bookmarks.
6. All information shall be able to be legibly printed.
7. Sufficient information, such as as-built control drawings for air handling system and variable drive controls, shall be furnished to allow qualified personnel to service equipment.

- B. Submit Project Record Documents to the Architect prior to Substantial Completion in accordance with Section 01700, Project Closeout.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section specifies administrative and procedural requirements for cutting and patching. Requirements of this section apply to mechanical and electrical installations.

1.2 SUBMITTALS

- A. Submit a proposal describing procedures a minimum of seven (7) calendar days in advance of the time cutting and patching will be performed and request approval to proceed. Do not proceed with cutting and patching until approval is obtained. Include the following information, as applicable, in the proposal.
1. Describe the extent of cutting and patching required and how it is to be performed. Indicate why it cannot be avoided
 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements
 3. Indicate dates when cutting and patching is to be performed. These dates must be acceptable to the owner and may include after-hours or weekend work.
 4. List utilities that will be disturbed or affected including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. Electrical shut-downs, where required, shall be strictly coordinated with the Owner. Electrical shut-downs shall not occur without prior approval.
 5. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
- B. Review the effected work with the Architect prior to cutting and patching to ensure that preliminary work is complete.
- C. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

1.3 QUALITY ASSURANCE

- A. Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
1. Bearing and retaining walls
 2. Structural concrete
 3. Lintels

4. Miscellaneous structural metals
 5. Exterior curtain wall construction
 6. Equipment
 7. Piping, ductwork, vessels and equipment
- B. Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, result in increased maintenance or decreased operational life or safety. Obtain Owner approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
1. Primary operational systems and equipment
 2. Air or smoke barriers
 3. Water, moisture, or vapor barriers
 4. Membranes and flashings
 5. Fire protection systems
 6. Noise and vibration control elements and systems
 7. Control systems
 8. Communication systems
 9. Electrical wiring systems
- C. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities or result in visual evidence of cutting and patching.
1. Retain the original installer or fabricator to cut and patch exposed masonry work.
 2. Retain the services of another installer or fabricator acceptable to the Architect if the original installer or fabricator is unable to perform the work.
 3. Remove and replace work cut and patched in a visually unsatisfactory manner

PART 2 PRODUCTS

2.1 MATERIALS

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

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting existing surfaces. Take corrective action before proceeding if unsafe or unsatisfactory conditions are encountered.
- B. Meet at the site with the Architect and with parties involved in cutting and

patching, including mechanical and electrical trades, before proceeding with work. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Provide temporary support of work to be cut. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.
- B. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- C. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated, until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching. Schedule work to produce shortest possible down-time of utilities. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

3.4 CUTTING

- A. Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer. Comply with the original installer's recommendations.
- B. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering or chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- C. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
- D. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
- E. Comply with requirements of applicable sections of Division 2.
- F. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

3.5 PATCHING

- A. Patch with durable seams that are as invisible as possible. Comply with specified tolerances. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
- B. 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.

- C. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
- D. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.
- E. Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.6 CLEANING

- A. Maintain work area in a clean, neat and orderly condition at all times. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section sets forth regulations that shall be followed by the Contractor and all his forces, including but not limited to subcontractors, suppliers, vendors, delivery personnel, independent testing laboratory personnel and other personnel, hereinafter called "workers", when on the grounds of the of the Fire Station and while engaged in the execution of this contract.

1.2 REGULATIONS

- A. All work shall be conducted at the least inconvenience to the Owner. The existing fire station is a full time, 24 hour a day facility and all work shall be performed at the complete convenience of the Owner. Work may be required on nights and weekends to accommodate the best interest of the Owner.
- B. The Contractor shall acquaint all workers with all Fire Station traffic and parking regulations. Parking will be allowed on Owner's property for a few key, essential vehicles only as agreed upon by the Owner.
- C. All work involving any type of noise, vibration or dust shall be fully coordinated with the Owner. The contractor shall be responsible for maintaining complete dust and debris control and not allowing dust or debris to occur outside the project area or enter the occupied areas of the existing fire station. All work involving excessive noise shall be scheduled with the Owner.
- D. Contractor shall patrol the project and related areas used by the Contractor on at least a daily basis and keep these areas clean and free of dust, debris, trash, mud, etc. This shall include but not be limited to the project area and access to and from the project area.
- E. Workers are expected to conduct themselves in a professional manner and shall not use profanity, obscene language or obscene gestures which the Owner or Architect determines to be offensive or has objection to in any way.
- F. Workers who may, because of improper conduct or persistent violation of regulations, lack of professionalism or who become objectionable will be removed by the Contractor at the request of the Owner.
- G. Workers shall wear suitable shirts, pants, and shoes at all times.
- H. All contractors, sub-contractors, vendors, suppliers, working on the site or visiting the site are required to sign in with the Contractor and wear an approved visitors ID badge.
- I. Traffic control measures including but not limited to flagmen are required at all

times during construction on the adjacent roads and drives and shall comply with all applicable traffic laws and regulations.

- J. All areas not directly related to this project shall be "off limits" to the contractor and workers.
- K. This is a "No Smoking" and "Non Tobacco Use" facility or project site and no smoking and/or no tobacco products use shall be observed at all times.
- L. Use of and possession of alcohol, tobacco, firearms, weapons, illegal drugs or other illegal substances will not be allowed on the project site at any time.
- M. Organized safety measures shall be enforced on all construction work. Safety is the responsibility of the Contractor.
- N. Contractor shall provide in advance of any delivery of materials, Materials Data Safety Sheets for all materials used on the project.
- O. Contractor shall dispose of potentially harmful debris in accordance with all applicable environmental, legal and City of Jackson regulations.
- P. The Contractor shall obtain a copy of the City of Jackson Safety Program and acquaint all workers with all safety regulations.
- Q. The Contractor shall fully coordinate and obtain prior written approval for any shutdown or disruption of any existing fire station utility or service, electrical or otherwise, with the Physical Plant Department of the City of Jackson and the Fire chief. Written approval shall be obtained for each occurrence.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section sets forth specific sequencing requirements of the work in the project that are to be completed before other areas the project may begin.
- B. The Owner reserves the right to stop the work or any part of the work at any time he determines the work is interfering with or detrimental to the Owner's operations, areas or services. Once the Owner has determined that the Contractor has made necessary corrections or deviations, with written approval the Contractor may resume the work or part of the work. Such stoppages of the work or any part of the work shall not constitute a delay or justification by the Contractor for any additional time or money.

1.2 SEQUENCING

- A. No work can begin in any area until a detailed project staging, sequencing and work plan has been submitted and approved by the Owner. Project staging and work plan shall include all areas of work in the project and schedule of work in each area, indicating adjacent areas to be affected and remedies provided to keep Owner in operation.
- B. No work can begin in any area until all provisions required by Section 01560 Temporary Construction Confinement Systems and Section 01320, Construction Progress Documentation, and a detailed utility and service shut-down schedule have been submitted and approved.
- C. Contractor shall allow the Owner Fourteen (14) days to relocate furniture and equipment and related materials from the existing building to the new building before beginning the demolition of the existing building (Phase 3). The Contractor will not be complete with the work of Phase 2 until the Certificate of Substantial Completion is issued for the work of Phase 2.
 - 1. Work Phases
 - a. Phase 1 shall include demolition of existing structures located on the site except for the existing fire station facility.
 - b. Phase 2 shall be construction of the replacement fire station including related site work.
 - c. Phase 3 shall be the demolition of the existing fire station facility and related, filling, grading, and site work.

1.3 SUBMITTALS

- A. Submit a detailed project staging, sequencing and work floor plan, including but not limited to all construction phasing, start and stop dates, temporary construction, utility and services shut downs, completion dates, Owner access

routes, in multiple colors as applicable to delineate pertinent information.

1. Include provisions of Section 01320, Construction Progress Documentation (schedules, etc.).

B. Submit a detailed utility and service shut-down schedule, including but not limited to standard and emergency power, lighting, heating, ventilation and air conditioning, water, sanitary sewer, sprinkler, telephone systems, and data systems.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 02070

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Extent of selective demolition work is indicated on drawings. Demolition requires selective removal and subsequent offsite disposal.
- B. Types of Selective Demolition Work include, but are not limited to:
 - 1. Removal existing buildings indicated on drawings required to accommodate new construction, mechanical and electrical systems components.
 - 2. Removal of existing Fire Station Building, including related grading and sitework and capping of existing utilities.
 - 3. Removal of drives, walks, and other existing site amenities indicated on drawings.
 - 4. Removal of site landscaping, dirt, gravel and other work to accommodate exterior work and landscaping.

1.2 SUBMITTALS

- A. Submit schedule and drawings indicating proposed methods and sequence of operations for selective demolition to Owner's representative for review at least seven (7) calendar days prior to beginning demolition work. Include coordination for shut-off, capping, and continuation of utility services as required. Include plans and details for dust and noise control protection. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 1. Schedule and Site Drawing of Selective Demolition Activities shall include the following:
 - a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and other tenants' on-site operations are uninterrupted.
 - b. Method and location of discontinuing service to existing building to be demolished.
 - c. Interruption of utility services.
 - d. Coordination for shutoff, capping, and continuation of utility services. Coordination for shutoff, capping, and discontinuation of utility services to existing building prior to demolition.
 - e. Coordination of Owner's continuing occupancy of existing building and of Owner's partial occupancy of completed Work.
 - f. Discontinuing utility service to existing building and capping and/or removing utility lines to building.
- B. Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify

options if proposed measures are later determined to be inadequate.

- C. Submit demolition contractor qualification including list of completed projects of similar size and scope to the work of this project.
- D. Submit a list of items that have been removed and salvaged after selective demolition is complete.

1.3 QUALITY ASSURANCE

- A. Demolition contractor shall have a minimum of five (5) years experience specializing in demolition work similar in material and extent to that indicated for this Project.
- B. Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Comply with the latest edition of the following standards:
 - 1. ANSI A10.6: Safety Requirements for Construction and Demolition
 - 2. NFPA 241-00: Safeguarding Construction, Alteration, and Demolition Operations.
 - 3. RFCI-WP-88: Recommended Work Practices for the Removal of Resilient Floor Coverings.

1.4 COORDINATION

- A. Coordinate work with Owner's continuing occupation of existing building, with Owner's partial occupancy of completed work, and with Owner's other requirements.

1.5 JOB CONDITIONS

- A. Owner will be continuously occupying the existing building in and immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of seven (7) calendar days advance notice to Owner of demolition activities which will impact Owner's normal operations.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed. Storage or sale of removed items on site will not be permitted.
- D. Hazardous Materials: Hazardous materials are present in building to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified.

1.6 PROTECTIONS

- A. Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
- B. Provide protective measures to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
- C. Erect temporary covered passageways as required by authorities having jurisdiction, if any.
- D. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
- E. Construct temporary insulated solid dust-proof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Install dust-proof doors and security locks in partitions if required.
- F. Remove protections at completion of work.

1.7 DAMAGES

- A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

1.8 TRAFFIC

- A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, corridors, and other adjacent occupied or used facilities. Do not close, block or otherwise obstruct streets, walks, entrances, canopies, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by Owner.

1.9 EXPLOSIVES

- A. Use of explosives will not be permitted.

1.10 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain. Keep in service, and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

1.11 EXTERIOR ENVIRONMENTAL CONTROLS

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit

dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

- B. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect areas in which work will be performed prior to commencement of selective demolition work. Photograph existing damaged conditions to structure, surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work. Provide existing conditions photographs to Owner's representative prior to starting work.

3.2 PREPARATION

- A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain. Cease operations and notify the Owner's representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- B. Provide weatherproof closures for exterior openings resulting from demolition work.
- C. All work shall comply with NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations. Maintain all egress paths, minimum egress widths, smoke / heat detectors, fire suppression systems, emergency lighting and exit indicators as required by code.
- D. Locate, identify, stub off and disconnect utility services that are not indicated to remain. Provide by-pass connections as necessary to maintain continuity of service to occupied building until time for demolition. Provide minimum of seven (7) calendar days written advance notice to Owner if shut-down of service is necessary during change-over. Schedule utility disruptions or final disconnecting including electrical shut-offs at the convenience of the Owner.

3.3 DEMOLITION

- A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations. Schedule demolition at times acceptable to the owner, which may include after-hours or weekends.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools. Do not use power-driven impact tools.
- C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing
- D. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

- E. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.4 UTILITY SERVICES

- A. Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least seventy-two (72) hours written notice to Owner if shutdown of service is required during changeover.
- C. Refer to the contractor's demolition schedule and plan for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Sanitary Sewer Service Disconnection: All sanitary sewer services shall be disconnected and plugged in conformance with the City of Jackson regulations. Sanitary sewer abandonment must be completed by a licensed plumber, and inspected by City of Jackson, if applicable, prior to demolition or excavation.
- E. Service Disconnection: Water, gas, power and other services to existing building within the demolition work shall be disconnected by a qualified and licensed professional specializing in the work to be performed and shall be inspected and approved by the City of Jackson prior to demolition or excavation.

3.5 SALVAGE MATERIALS

- A. Where indicated on drawings as "Salvage" or "To be Reused", carefully remove indicated items, clean, store and protect for later reuse and installation.
 - 1. Furniture and accessories not tagged shall be relocated as directed by the owner.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.
- B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
- C. Burning of removed materials is not permitted on project site.
- D. Contractor is required to provide a dumpster for this project and is not to use the Owners dumpster at any time. Location of the Contractor's dumpster is to be coordinated with the Owner.

3.7 CLEAN-UP AND REPAIR

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
- B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02230 SITE CLEARING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This work shall consist of the removal and satisfactory disposal of existing pavement, curbs, buildings, pipelines and culverts, and other structures and obstructions designated in the plans or required by the work to be removed. This work shall also consist of necessary excavation incidental to the removal of each item.
- B. This work also includes clearing, grubbing, removing and disposing of all things within the limits of the right-of-way, easement areas, and borrow and material pits, except items designated to remain or be salvaged. This work shall also include the preservation from injury or defacement of all vegetation, objects, or materials designated to remain or to be salvaged, and the removal and disposal of obstructions or salvage material when their removal and disposal is not otherwise provided in the contract.

1.02 STATUTORY REQUIREMENTS

- A. The International Building Code shall govern the demolition, modification, and alteration of existing structures and buildings.

1.03 CONSTRUCTION REQUIREMENTS

- A. Contractor shall preserve and protect all structures, trees, fences, public and private utilities, and improvements, above or below the ground, which are to remain or be removed by others.
 - 1. All desirable growth within the right-of-way and easement areas shall be preserved where practicable, while all items which detract from the aesthetic value of the completed work, in the Architect's/Engineer's or Owner's opinion, unnecessarily interfere with construction, or would interfere with future maintenance shall be removed.
- B. Clearing and Grubbing: Surface objects, trees, stumps, roots, and other protruding or underground obstructions, not designated to remain, shall be cleared and grubbed (including mowing, as required). Undisturbed stumps and roots and non-perishable solid objects which will be a minimum of three (3') feet below subgrade or slope of embankment may be left when authorized by the Architect/Engineer.
- C. Contractor shall remove and satisfactorily dispose of all items demolished, except those items indicated to remain or be otherwise removed and disposed of. Basements or cavities left by obstruction removal shall be filled to the level of the surrounding ground.
- D. Contractor shall provide at his expense a suitable offsite area for disposal of

items removed.

E. Notification

1. At least 48 hours prior to commencement of a demolition or removal, notify the Architect/Engineer in writing of proposed schedule. Owner shall inspect the existing equipment and to identify and mark those items which are to remain the property of the Owner. No removals shall be started without the permission of the Architect/Engineer.
2. Prior to any demolition or excavation, the Contractor shall locate all underground utilities by contacting Mississippi One Call at **1-800-227-6477 or 811.**

F. Protection of Structures and Roadways

1. Execute the demolition and removal work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
2. Closing or obstructing of roadways, sidewalks and passageways adjacent to the work by the placement or storage of materials will not be permitted without the permission of the Architect/Engineer, and all operations shall be conducted with a minimum interference to traffic on all traveled ways.
3. Contractor shall not remove or disturb any buildings, public utilities, or other public or private improvements that are to be removed and replaced or reconstructed by the Owner or the property or utility owners under separate agreement.
4. Erect and maintain barriers, lights, sidewalk, sheds and other required protective devices to prevent unrestricted public access to demolition sites.

G. Burning or use of explosives is not permitted.

1.04 REMOVALS

- A. Concrete pavement, sidewalks, curbs, gutters, etc., designated for salvage shall be broken into pieces not exceeding 150 pounds and stockpiled at locations designated by the Architect/Engineer at a location selected or acceptable to the Owner.
- B. Mechanical removals (i.e., piping and appurtenances) shall include the dismantling, removal, cutting, capping, and plugging of all required utility removals.
- C. Existing water, wastewater, and other piping not required for the site improvements shall be removed where shown or where it will obviously interfere with construction of the proposed improvements. Piping not indicated to be

removed or which does not interfere with new work shall be removed to the nearest solid support, capped and left in place or as directed by the Architect/Engineer.

- D. When underground piping is to be removed or altered, the remaining piping shall be properly capped. Abandoned underground piping may be left in place unless it interferes with new work or is shown on the drawings to be removed.

1.05 DISPOSAL AND SALVAGE

- A. Salvageable material and equipment listed hereinafter or within the plans shall become the property of the Owner. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.
- B. All other property not specifically designated for salvage shall become the Contractor's property and must be removed from the site.
- C. When off-site disposal area is not owned by Contractor, the Contractor shall provide documentation to the Owner and the Architect/Engineer that permission was given by property owner for use of such land as an off-site disposal area.

1.06 CLEAN UP

- A. Remove all debris from the site resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left clean, neat and orderly.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes subsurface treatment for termite protection.

1.2 QUALITY ASSURANCE

- A. Comply with manufacturer's instructions and recommendations for the work including preparation of substrate and application products.
- B. The pest control operator shall be licensed by the State of Mississippi, Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry in accordance with regulations of governing authorities for application of soil treatment solution. The pest control operator shall have a minimum of 5 years experienced and shall have completed termite treatment similar to that indicated for this project. The pest control applicator shall have a record of successful in-service performance. The pest control operator shall have a valid license, and the company technician is to have a valid identification card for pest control. The company vehicle shall be clearly marked with the company name.
- C. Comply with Mississippi Regulations Governing Pest Control Operators in following the labels of the termiticide. All products used on the site are to be clearly labeled at all times.
- D. Use an insecticide (termiticide) chemical solution acceptable to the Division of Forest Research, Forest Service, USDA, and/or products registered with the Pesticide Regulation Section, Plant Pest Control Branch, Agricultural research Service USDA, under the Federal Insecticide and Rodenticide Act, for use a termite toxicant for which prolonged effectiveness may be anticipated. Insecticide (termiticide) chemical solution shall also be EPA registered and suitable for use under the conditions indicated.
- E. Comply with Environmental Protection Agency (EPA) requirements.

1.3 SUBMITTALS

- A. Submit treatments, manufacturer's technical data on all chemicals, dyes, additives, application products and application instructions, including EPA-Registered Label.
- B. Submit certificates signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Submit qualifications of company demonstrating capabilities and experience. Submit training and licensing for applicator performing work. Include lists of recently completed projects, sizes of projects, with project names and

addresses, names and addresses of architects and owners and other related information.

- D. After application of termiticide is completed, submit report for owner's record information, including the following:
1. Date and time of application
 2. Moisture content of soil before application
 3. Weather conditions at time of application and immediately prior to and following application
 4. Brand name and manufacturer of termiticide
 5. Quantity of undiluted termiticide used
 6. Dilutions, methods, volumes and rates of application used.
 7. Areas of application
 8. Water source for application
 9. Submit a written copy of the Guarantee

1.4 PROJECT CONDITIONS

- A. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations that would not be detrimental to the treatment.
- B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Do not apply soil treatment during rain or similar conditions. Comply with other handling and application instructions of the soil toxicant manufacturer.

1.5 GUARANTEE

- A. Furnish written guarantee in form and substance satisfactory to the Owner and the Architect certifying that the applied soil treatment will prevent the infestation of subterranean termites, including Formosan termites (*Coptotermes*), and, that if termite activity is discovered during the guarantee period, the Contractor will provide complete re-treatment and will repair any damage required for investigation or discovery. Provide guarantee for a period of five (5) years from date of substantial completion, signed by the Application Sub-contractor and the Contractor. The Contractor shall repair all damage caused by subterranean termites within the guarantee period.

PART 2 PRODUCTS

2.1 SOIL TREATMENT

- A. Use an emulsible concentrate insecticide (termiticide) for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution equal to one of the following chemical elements:
 - 1. Fipronil
 - 2. Cypermethrin
 - 3. Permethrin
 - 4. Imidacloprid
- B. Other solutions may be used if submitted and approved by Architect, comply with the specifications herein and if acceptable to local and state governing authorities. Use only soil treatment solutions which are not injurious to planting.
- C. Soil treatment solution shall contain dye in sufficient quantities so that treated area is obvious to the architect upon observation. Dye shall not be harmful to the environment.

PART 3 EXECUTION

3.1 INSPECTION

- A. Applicator must examine the areas and conditions under which soil treatment for termite control is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.

3.2 APPLYING SOIL TREATMENT

- A. Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
- B. Treat areas at the following rates:
 - 1. Under slab-on-grade, suspended slab, foundation footings and other similar structures, treat the soil before concrete slabs and footings are placed, at a minimum rate of 1 gallon per 10 square feet, and where substrate is gravel or coarse absorbent material, increase rate to 1 1/2 gallons per 10 square feet, unless manufacturer's requirements differ.
 - 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric or communications conduit penetrating slab,

and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing, at a minimum rate of 2 gallons per 5 linear feet, unless manufacturer's requirements differ. Avoid soil washout around footings.

3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground. Apply at a rate per manufacturer's requirements.
 4. Masonry: Treat all voids. Apply at a rate per manufacturer's requirements.
 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated, at a minimum rate of 2 gallons per 5 linear feet, unless manufacturer's requirements differ
- C. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs, footings and foundations. Termiticide may be applied before placement of compacted fill under slabs, if recommended by termiticide manufacturer.
- D. Verify application volumes and rates where fill is soil or unwashed gravel, where fill is washed gravel or other coarse absorbent material, or where fill is absorbent soil or fill (sand, sand and gravel mix, etc.).
- E. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.
- F. Protect termiticide solution dispersed in treated soils from being diluted until ground supported slabs are installed. Use a waterproof barrier according to EPA-Registered label instructions.
- G. Post signs in the areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.
- I. Retreatments: Soil treatment sub-contractor shall perform an inspection at yearly intervals during the Guarantee period. If inspection identifies the presence of termites, retreat soil and similar areas.

END OF SECTION

SECTION 02300 - EARTHWORK

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform all excavation work and earthwork, including placement of fill and backfill, to grade the site to the elevations and slopes shown on the Drawings and as needed to meet the requirements of the Contract.
- B. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to insure the safety of personnel and protect adjacent structures, piping, etc, in accordance with Federal, State and local laws, regulations and requirements.

1.02 STATUTORY REQUIREMENTS

- A. All excavation, trenching, sheeting, bracing, etc. shall comply with the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations regarding excavation safety standards (29 CFR Part 1926).

1.03 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - Section 02230 – Site Clearing
 - Section 02370 – Erosion Control
 - Section 02511 – Hot-Mix Asphalt Paving
 - Section 02520 – Water Distribution
 - Section 02530 – Sanitary Sewer
 - Section 02630 – Storm Drainage
 - Section 02751 – Concrete Paving
 - Section 02931 – Seeding Fertilizing and Mulching

1.04 SUBMITTALS

- A. Submit to the Architect/Engineer, in accordance with Division I Sections regarding submittals, the proposed methods of construction, including excavation, excavation support systems design, backfilling, filling, compaction, dewatering and drainage for the various portions of the work.
- B. Excavation support system designs and dewatering systems shall be prepared by a licensed professional Engineer, registered in the state of Mississippi, having a minimum of five (5) years of professional experience in the design and construction of excavation support systems. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.

1.05 QUALITY ASSURANCE

- A. The Contractor is responsible for verifying the quality of the work and shall employ a qualified professional geotechnical Engineering firm or commercial testing company to verify compaction and density tests on request of the Architect/Engineer to check compliance with these specifications. A copy of the test results shall be furnished to the Architect/Engineer.
- B. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with the soils testing laboratory to verify the suitability of the existing subgrade soil and to perform in-place soil density tests as required to verify that the bearing capacity of the subgrade is sufficient.
- C. Prior to and during the placement of backfill and fill coordinate with the soils testing laboratory to perform in-place soil density tests to verify that the backfill/fill material has been compacted in accordance with the compaction requirements specified elsewhere. The Architect/Engineer may designate areas to be tested.

1.06 DEFINITIONS

- A. General or common fill is material excavated during construction. General fill material may be used as topsoil or for general grading provided it is free of roots, stone, and other deleterious material. This material shall not be used as structural backfill beneath foundations or as a base or subbase.
- B. Select fill shall be material not native to the site, but imported from approved borrow pits, for use as backfill beneath foundations or as a base or subbase.

1.07 EXISTING CONDITIONS

- A. Documentation regarding existing soil conditions, in addition to the topographic survey supplied in the Contract Documents, may also include the following:
 - 1. Project site record drawings
 - 2. Geotechnical Investigation
 - 3. Other available information

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIAL

- A. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in length, and with not more than 15% of the rock or lumps larger than 2-3/8" in length.
- B. Fill material is subject to the approval of the construction geotechnical Architect/Engineer, and is that material removed from excavations or imported from off-site borrow areas, predominately granular non-expansive soils, free from roots or other deleterious matter.
- C. Approved Soil Materials

1. Select Fill: Material shall be either a silty clay (CL) or sandy clay (CL) having a liquid limit of less than 45 and a plasticity index of between 10 and 25.
 - a. On-site soil material can be used if it meets these requirements. Some processing and moisture conditioning of these on-site materials may be required to meet compaction requirements depending on weather conditions.
 - b. In no case shall clay soil (CH) having a high plasticity and shrink/swell potential be used for fill or backfill on this site.
 2. Coarse Aggregate: Washed stone, free of shale, clays, friable material, sand, and debris; graded in accordance with ANSI/ASTM C33, Size #467.
 3. Pea Gravel: Natural stone, washed, free of clay, shale and organic matter; graded to the following:
 - a. Minimum size: 1/4-inch.
 - b. Maximum size: 5/8-inch.
 4. Sand: Natural sand or bank sand, washed, free of silt, clay, loam, friable or soluble materials, or organics; graded in accordance with ANSI/ASTM C33.
- D. Do not permit rocks longer than 1" in the upper 12" of fill or embankment.
- E. Structural fill shall be cohesion less material used for structural backfill; provide sand free from organic material and other foreign matter, and as approved by the construction geotechnical Engineer.

2.02 TOPSOIL

- A. Where shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from sub-soils, roots, heavy or stiff clay, stones larger than 2' in length, noxious weeds, sticks, brush, litter, or other deleterious matter.
- B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.03 GEOTEXTILE FABRIC

- A. Filter Fabric: Manufacturer's standard non-woven perilous geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
 1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
 - a. Grab Tensile Strength (ASTM D4 632): 100 lb.

- b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard sieve.
- c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.

PART 3 – EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.
2. Test pits shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans.

B. Protection of Persons and Property

1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise instructed.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
4. Contractor shall be responsible for providing barricades, warning signs, lights, indicators, and other standard traffic control and construction zone warning devices required to delineate the work zone and protect the general public from injury from his construction operations.

C. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work. These systems shall be the responsibility of the Contractor and design of these systems shall be submitted to the Architect/Engineer.
2. Use water or other means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
3. Do not restrict access to adjacent properties.

3.02 EXCAVATION SUPPORT

- A. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.
- B. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.
- C. Excavation Supports Left in Place
 - 1. Excavation supports that are required to remain in place, if applicable, are discussed in Section 02221.

3.03 PROTECTION OF EXISTING UTILITIES

- A. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional charge to the Owner.
- B. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
- C. If the service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
- D. If the existing utilities are found to interfere with the permanent facilities being constructed under this Section or this Contract, immediately notify the Architect and secure his instructions.
- E. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

3.04 EXCAVATION PROCEDURES

- A. Excavations for structures shall be suitably wide for construction of the structures, including excavation supports, dewatering and drainage systems and working clearances.
- B. Excavated material considered suitable for use as fill or backfill shall be

transported to and placed in fill or embankment areas within the limits of the project.

C. When excavations have reached the required subgrade, notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings.

1. Areas at finished subgrade or areas to receive fill shall be proof rolled with a loaded tandem-axle dump truck or similar pneumatic-tire equipment with a minimum weight of 15 tons and a maximum weight of 25 tons.
2. Areas that yield or "pump" under the proof rolling or under construction traffic shall be mitigated as required by the geotechnical Engineer. Acceptable mitigation methods include:
 - a. Disking or aerating the upper 12" to 18" of soil by opening the ground surface and turning the soil several times a day to reduce moisture content to optimum.
 - b. Over-excavation to a depth of 3 to 4 feet below finish grade elevation and replacement with dry select fill material. A woven geotextile fabric lining may be placed at Architect/Engineer's direction on the base of the excavation prior to backfill. When geotextile fabric is used, it shall be placed with a minimum overlap of 24" at all joints, with the overlap placed in the direction of fill placement. The initial lift of fill material over the geotextile shall be 12" to 18" loose thickness, consisting of clean sand that is non-plastic and has less than 15% of the soil particles passing the #200 sieve.
 - c. Application of hydrated lime at a rate of 4 lbs per sq yard per in. depth to wet/unstable soils near the ground surface.
3. If the existing subgrade soils are determined to be unsuitable to remain, the Architect/Engineer will provide direction regarding removal and replacement with select bedding material. If Contractor believes that such direction would drastically increase his cost and would thereby entitle Contractor to a change in Contract price, Contractor shall notify the Architect/Engineer in accordance with the applicable article(s) in the Contract and Division I pertaining to changes in the work.

D. Surplus Materials

1. Dispose of unsatisfactory excavated materials, and surplus satisfactory excavated materials, to an off-site location arranged and paid for by the Contractor. If permit is required for off-site disposal area, copy of such permit shall be provided to the Architect/Engineer for his review and approval.

E. Rock Excavation

1. Where rocks, boulders, granite, or similar material is encountered, and

where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required actions to proceed with the general grading operations of the Work, and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger buildings or structures whether on or off the site.

2. Use of explosives is prohibited.
- F. Excavate and backfill in a manner and sequence that will provide positive drainage at all times away from buildings and structures.
- G. Ditches and Gutters
1. Cut accurately to the cross-sections, grades, and elevations shown.
 2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.
- H. Unauthorized Excavations
1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Architect/Engineer or the Geotechnical Engineer.
 2. Under footings, foundations or retaining walls:
 - a. Fill unauthorized excavation by extending the indicated bottom excavation of the footing or base to the excavation bottom, without altering the required top elevation.
 - b. When acceptable to the Geotechnical Engineer, lean concrete fill may be used to bring bottom elevations to proper position.
 3. The Owner shall not be charged extra cost for materials required to backfill unauthorized excavations.
- I. Stability
1. Excavation slopes shall be no steeper than 1:1 where groundwater is not present and no steeper than 2.5:1 where groundwater is encountered.
 2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
 3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

3.05 FILLING AND BACKFILLING PROCEDURES

- A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.

- B. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks, tractor dozers weighing at least 30,000 lbs and operated at full speed, or heavy vibratory rollers. Compaction in confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 8 inches (measured before compaction) when hand operated equipment is used.
- C. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact. The onsite resident inspector and the Architect/Engineer will determine this.
- D. General or common fill may not be used in areas beyond those designated for select fill unless shown or specified otherwise.
- E. Fill required beneath building slabs, slabs on grade, and sidewalks shall be select fill. Place and compact structural fill in even lifts.
- F. Ground Preparation
 - 1. Prior to placing embankment fill materials, all organic materials (including peat and loam) and loose inorganic silt material (loess) shall be removed from areas beneath the embankments.
 - 2. If the subgrade slopes are excessive, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of embankment materials. The existing subgrade shall then be scarified to a depth of at least 6 inches.
- G. Embankment fill shall consist of select fill and limestone material and shall be placed and compacted in even lifts.

3.06 COMPACTION REQUIREMENTS

- A. Place backfill and fill materials in loose lifts not more than 8" in thickness.
- B. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content required by the Drawings or the Geotechnical Engineer.
- C. Compact each layer to the required percentage of maximum density for the area.
- D. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- E. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Geotechnical Engineer.
 - 1. Buildings and Structures

- a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 95% of maximum density.
- 2. Lawns and Unpaved Areas
 - a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density;
 - b. Compact the upper 12" of filled areas, or natural soils exposed by excavating, at 90% of maximum density.
- 3. Walks
 - a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 95% of maximum density.
- 4. Pavements
 - a. Compact the top 12" of subgrade and each layer of fill material or backfill material at 98% of maximum dry density for cohesive soil material.
- F. Fill material shall be placed and compacted at a moisture content within 4% of optimum.

3.07 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

- A. Unsuitable, waste and surplus excavated material shall be removed and disposed of off-site at the contractor's expense and in approved locations. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the site.

3.08 GRADING

- A. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of.
- B. Subgrade shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc, to intercept or divert surface water that may affect the execution or condition of grading work.
- C. If at the time of grading it is not possible to place any material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.
- D. Stones, rock fragments, roots or stumps will not be permitted within the top 6-in of the finished grade of fills and embankments.
- E. In cut areas, all loose or protruding rocks or stumps in slopes shall be removed to

line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings unless otherwise directed by the Architect/Engineer.

F. Building Areas

1. Grade areas adjacent to buildings to achieve drainage away from the buildings and structures, and to prevent ponding.
2. Finish the surfaces to be free from irregular changes, and shape the surface of areas scheduled to be under walks to line, grade, and cross-section, with finished surface not more than 0.10-ft above or below the required subgrade elevation.

3.09 FIELD QUALITY CONTROL

- A. Secure the Geotechnical Engineer's inspection and approval of subgrade and fill layers prior to beginning construction of structures and pavements.
- B. Provide at least the following tests to the approval of the Geotechnical Engineer:
1. At paved areas, at least one field density test for every 2,000-sq. ft. of paved area, but not less than three (3) tests
 2. In each compacted fill layer, one field density test for every 2,000-sq. ft. of overlaying paved area, but not less than three (3) tests.

3.10 MAINTENANCE

- A. Protection of newly graded areas
1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;
 2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

END OF SECTION

SECTION 02315 - TRENCHING AND BACKFILLING FOR UTILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to excavate trenches for utilities from outside of building.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including, but not limited to the following sections:

Section 02300 – Earthwork
Section 02520 – Water Distribution
Section 02530 – Sanitary Sewer
Section 02630 – Storm Drainage

- B. REFERENCES

1. ANSI/ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates
2. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12-inch Drop.
3. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.03 COORDINATION

- A. Coordinate work with other trades.
- B. Verify work associated with lower elevation utilities are complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Approved soil materials as specified in Section 02300 and as indicated on the drawings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- C. Protect bench marks, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities which are to remain.
- E. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with select material and compact to density equal to or greater than requirements for subsequent backfill material.

3.02 EXCAVATION

- A. Excavate subsoil required for utilities.
- B. Cut trenches sufficiently wide to enable installation and allow inspection.
- C. Hand trim excavations. Hand trim for bell and spigot pipe joints. Remove loose materials.
- D. Remove lumped subsoil.
- E. Correct areas over excavated in accordance with Section 2300.

3.03 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Granular Fill: Place and compact materials as illustrated on the drawings in continuous layers not exceeding 6 inches compacted thickness. Compact with vibratory equipment.
- D. Select Fill: Place and compact material in continuous layers not exceeding 8 inches compacted thickness. Compact to 95% of Standard Proctor Density (ASTM D698).
- E. Employ a placement method that does not disturb or damage pipe in trench.
- F. Maintain optimum moisture content of fill materials to attain required compaction density.
- G. Remove surplus fill materials from site.

3.04 TOLERANCES

- A. Top surface of general backfilling: +/-0.08 feet from required elevations.

3.05 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ANSI/ASTM D698 and ASTM D2922.
- B. If tests indicate installation does not meet specified requirements, remove installed material, replace with acceptable material, compact and retest.
- C. Frequency of Tests: Compaction tests shall be taken each lift at 200 foot intervals.

3.06 PROTECTION OF FINISHED WORK

- A. Protect finished installation.
- B. Reshape and recompact fill materials subjected to vehicular traffic during construction.
- C. Density tests will be taken by a representative of the Owner and will be paid by the Owner. Contractor will be responsible for contacting the testing laboratory when density testing is necessary.

END OF SECTION

SECTION 02370 EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to perform all installation, maintenance, removal and area cleanup related to sedimentation control specified herein or by local environmental regulations. The work shall include, but not be limited to, installation of temporary access ways and staging areas, silt fences, stone filter boxes, stone filter berms, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, excelsior matting installation and final cleanup.

1.02 RELATED WORK

- A. Earthwork is included in Section 02300.

1.03 SUBMITTALS

- A. Submit to the Architect/Engineer for approval, technical product literature for all commercial products to be used for sedimentation and erosion control.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Silt Fence
 - 1. Steel posts shall be a minimum of 5 feet in length, 2-1/2 inch by 2-1/2 inch by 1/4-inch angle post with self-fastening tabs and a 5-inch by 4-inch (nominal) steel anchor plate at bottom.
 - 2. Welded wire fabric shall be 4-inch by 4-inch mesh of 12-gauge by 12-gauge steel wire.
 - 3. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, NC or equal.
 - 4. Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips (hog rings), or 1/32-inch diameter soft aluminum wire.
 - 5. Prefabricated commercial silt fence may be substituted for built in-fence. Pre-fabricated silt fence shall be "Envirofence" as manufactured by Mirafi Inc., or equal.
- B. 1/4-inch woven wire mesh shall be galvanized steel or hardware cloth.

- C. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10 inches or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.
- D. Latex acrylic copolymer, such as Soil Sealant with coalescing agent as manufactured by Soil Stabilization Co. or equivalent shall be used as straw mulch tackifier.
- E. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Architect/Engineer.
- F. Excelsior matting blanket shall be installed in all seeded drainage swales and ditches as directed by the Architect/Engineer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Silt Fence Installation
 - 1. Silt fences shall be positioned as necessary to prevent off site movement of sediment produced by construction activities as directed by the Architect/Engineer.
 - 2. Dig trench approximately 6 inches wide and 6 inches deep along proposed fence lines.
 - 3. Drive metal-stakes, 8 feet on center (maximum) at back edge of trenches. Stakes shall be driven 2 feet (minimum) into ground.
 - 4. Hang 4 x 4 woven wire mesh on posts, setting bottom of wire in bottom of trench. Secure wire to posts with self-fastening tabs.
 - 5. Hang filter fabric on wire carrying to bottom of trench with about 4 inches of fabric laid across the bottom of trench. Stretch fabric fairly taut along fence length and secure with tie wires 12 inches O.C. both ways.
 - 6. Backfill trench with excavated material and tamp.
 - 7. Install pre-fabricated silt fence according to manufacturer's instructions.
 - 8. Staging areas and access ways shall be surfaced with a minimum depth of 6-inch of crushed stone. Construction access ways will be a 20-foot minimum width.

3.02 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Make a visual inspection of all sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into the vent trench, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

B. Maintenance

1. Silt Fences

- a. Care shall be taken to minimize the movement of sediment into all storm drain appurtenances and public streets until the impervious material (road/parking area surface) is applied.
- b. A drop inlet sediment trap with perimeter silt fencing or properly installed hay bale barriers is the recommended method of inlet protection. Sediment will be removed from the excavated drop inlet sediment trap and restored to the original depth when sediment accumulation has reached half the depth of the trap.
- c. All erosion and sediment control measures will be checked for stability and operational integrity following every runoff producing rainfall but in no case less than every other week. Any necessary repairs shall be made immediately to maintain the fence's performance as designated.
- d. Sediment will be removed from the upstream face of the silt fence when it reaches a maximum six-inch (6") depth at the fence. The fence shall be replaced as necessary to maintain a barrier.

2. Add crushed stone to access ways and staging areas as necessary to maintain a firm free of ruts and mudholes.

3.03 TEMPORARY MULCHING

- A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.
- B. Straw mulch shall be applied at rate of 100lbs/1000s.f. and tackified with latex acrylic copolymer at a rate of 1 gal/1000 s.f. diluted in a ratio of 30 parts water to 1 part latex acrylic copolymer mix.

3.04 REMOVAL AND FINAL CLEAN-UP

- A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

END OF SECTION

SECTION 02520 WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide potable water and fire-protection distribution system as shown on the Drawings.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of Division I Section covering submittals.
- B. Product Data: Within 45 calendar days after the Contractor has received the Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when reviewed and approved by the Architect/Engineer, will become the basis for accepting or rejecting the actual installation procedures used on the Work.

PART 2 - GENERAL

2.1 PIPE AND FITTINGS

- A. General:
 - 1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required unless otherwise indicated on the Drawings
 - 2. Pipe materials 3" in size and larger: Use cast iron, ductile iron, plastic, or asbestos cement pipes unless otherwise indicated or approved in advance by the Architect/Engineer.
 - 3. Pipe materials less than 3" in size: Use plastic or galvanized steel.
- B. Pipe:
 - 1. Asbestos cement pipe:
 - a. Comply with AWWA C400, Class 150, unless otherwise indicated on the Drawings, specified herein, or directed by the Architect/Engineer.

2. Cast iron pipe:
 - a. Comply with ANSI A-21.6 or ANSI A-21.8, with working pressure of not less than 150 psi unless otherwise shown or specified.
 - b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
3. Ductile iron pipe:
 - a. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
 - b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
4. Plastic pipe:
 - a. Use polyvinyl-chloride (PVC) complying with ASTM D1785, Schedule 40, or
 - b. Use acrylonitrile-butadiene-styrene (ABS) complying with ASTM D15527.
 - c. All plastic pipes shall be NSF approved. Contractor to provide written certification that pipe meets NSF requirements.
5. Galvanized steel:
 - a. Use schedule 40 steel pipe risers and fittings, with PVC or ABS couplings below grade to steel risers for hose bibbs, and complying with ASTM A120.

C. Joints:

1. Asbestos cement pipe: Use couplings of the same materials as the pipe, with rubber rings complying with ASTM D1869.
2. Cast iron or ductile iron pipe:
 - a. Ductile iron: use mechanical joints complying with ANSI A-21.11 as modified by ANSI A-21.51 for ductile iron pipe, with push-on joints complying with ANSI A21.11 for cast iron, and ANSI A-21.51 for ductile iron; or
 - b. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.

3. Plastic pipe:
 - a. Use solvent cement for PVC joints complying with ASTM D2564.
 - b. Use solvent cement for ABS joints complying with ASTM D2235.
 4. Steel pipe fittings 2-1/2" or less in diameter:
 - a. Use malleable iron bonded screw fittings, manufactured to standards of ANSI B-16.3.
 - b. Use unions which are screwed, malleable iron, ground joint, 300 lb AAR, with bronze to iron seat.
 5. Make connections between asbestos cement pipe and cast iron fittings and valves with jointing materials that comply with AWWA C603.
- D. Fittings and specials:
1. Asbestos cement pipe:
 - a. Use fittings and specials of cast iron, bell-end, complying with ANSI A-21.10, 150 psi pressure rated, except that profile of bell may have special dimensions as required by the pipe manufacturer.
 - b. Use cement mortar lining complying with ANSI A-21.4, standard thickness.
 2. Cast iron pipe and ductile iron pipe:
 - a. Use fittings and specials suitable for 150-psi pressure rating unless otherwise specified.
 - b. For use with mechanical joint pipe, comply with ANSI A-21.10.
 - c. For use with push-on joint pipe, comply with ANSI A21.10 and ANSI A-21.11.
 - d. Use cement mortar lining complying with ANSI A-21.4, standard thickness.
 3. Plastic pipe:
 - a. Use fittings and specials suitable for Schedule 40 rating, unless otherwise specified or directed.
 - b. Use fittings and specials for PVC pipe complying with ASTM D2468.

c. For threaded PVC fittings, use Schedule 80.

4. Steel pipe:

a. Comply with ANSI B 16.3, using fittings and specials made for steel pipe.

E. Valves

1. Gate Valves:

a. Use gate valves designed for a working pressure not less than 150 psi.

b. Valves smaller than 3":

(1) Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland, and nut, with non-rising stem.

(2) Buried valves: Install in suitable precast concrete hand hole with cover marked "WATER".

c. Valves 3" and larger:

(1) Design in accordance with AWWA C500, standard, bronze trimmed, non-rising stem, solid wedge disc valves.

(2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.

(3) Provide tee handle socket operating wrenches of suitable size.

2. Check valves:

a. Use check valves designed for a working pressure not less than 150 psi, or as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.

b. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure, and to close tightly to prevent return flow when the discharge pressure exceeds inlet pressure.

c. Distinctly cast on the body of each valve:

(1) Manufacturer's name, initials, or trademark;

(2) Valve size;

(3) Working pressure;

- (4) Direction of flow.
- d. Valves 2" and smaller: Provide all bronze designed for screwed fittings.
- e. Valves larger than 2":
 - (1) Provide iron body, bronze mounted, with flanged ends, of the non-slam type.
 - (2) Provide class 125 flanges complying with ANSI B 16.1

F. Service Fittings:

- 1. Asbestos cement main, 6" or less in diameter:
 - a. For 3/4" service diameter, use 3/4" corporation stop.
 - b. For service 1" in diameter to 2-1/2" in diameter, use double strap service clamp with corporation stop.
- 2. Asbestos cement main, 8" in diameter and larger:
 - a. For service 3/4" in diameter to 1" in diameter, use 1" corporation stop.
- 3. PVC mains smaller than 2" in diameter:
 - a. Make 3/4" maximum service with tees or plastic valve tees.
- 4. PVC mains 2" to 3-1/2" in diameter: For 3/4" service to 1" service, use bronze service clamp and bronze corporation stop designed for PVC pipe.
- 5. Service clamps and corporation stops:
 - a. Use Bronze. Provide service clamp with flattened straps and molded neoprene gaskets.
- 6. Services larger than those stated above: Make with standard tees on new lines, and tapping tees on existing lines.

2.2 PIPELINE APPURTENANCES

A. TAPPING SLEEVES

- 1. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASA series 15):
- 2. Connections to existing mains to be made by the City at Contractor's

expense.

B. THRUST BLOCKS

1. Where thrust blocking is used, the concrete shall have a compressive strength of not less than 2,000 psi after 28 days.
2. Blocking shall be placed between solid, undisturbed ground and the fitting to be anchored, and the blocking shall be so located as to contain the resultant thrust force and in such a way that the pipe and fitting joints will be accessible for repair

C. AIR RELEASE VALVES

1. Air release valves shall be located as shown on the drawings, and shall be two (2") inch Valve and Primer Company, APCO 205 with ½" orifice diameter, Crispin Air Control Valves, PL-20 (NPT), PL-21 (Flg.), or approved equal.
2. Flange fittings shall comply with AWWA C110 and have ANSI B15.1 Class 125 flanges. Air valve assemblies shall be installed as shown on the drawings.

D. BLOW-OFF VALVE ASSEMBLIES

1. Blow-off assemblies of the size specified shall be located as shown on drawings. Blow-off assembly shall include all necessary valves, pipe, fittings, vaults or boxes, and specials, all to be in accordance with the Contract Drawings and the appropriate AWWA Standards.

E. FIRE HYDRANTS

1. Fire hydrants shall be installed by the Contractor at locations as shown on the drawings. Fire hydrants shall be manufactured to the latest design conforming to the current AWWA C-502 and be of the breakable or traffic design, yet meeting the 150 PSIG working pressure and 300 PSIG hydrostatic pressures. The following requirements shall apply:
 - a. The hydrant main valve shall close with the pressure and all operating parts, including valve top, drain ring, and seat shall be all bronze, known as 85-5-5-5 bronze, meeting either of the following ASTM; B-61, B-62, B-98, or B-150 as prescribed by AWWA C-502.
 - b. Friction losses thru the hydrant shall not exceed 2.5 PSI at 1000 GPM thru the pumper nozzle and 1.25 PSI thru two hose nozzles simultaneously when tested as outlined by AWWA C-502.
 - c. Hydrants shall be easy and economical to install and maintain, shall incorporate no parts requiring field adjustment, and shall place the nozzles at least 18" from ground line, measured not more than 2" below the mating of the ground or traffic flange to the

nozzle barrel, complying with the National Fire Protection Association, 13th edition handbook.

- d. Hydrant barrels shall be cast of gray iron, meeting ASTM A-126, Class B, with hydrant shoes and glands being of same material. Hydrant design shall be such that easy installation of extensions can be accommodated either at the ground line or shoe connection without shutting off water.
- e. The bell or shoe inlet shall be 6" mechanical joint complete with accessories with the hydrant bury being suitable for 3' to 8' depth, as specified.
- f. Hydrants shall be of the three-way design, and shall have one 4" pumper and two 2-1/2" hose nozzles meeting the City thread specifications that assure interchangeability of nozzle/hose connection. Further, hydrants shall open to the left, have a 1-1/2" pentagon opening nut (point to flat) and shall have all operating threads sealed from the water in an oil reservoir by two O-Ring Seals, one sealing the oil, and one sealing the water, and be protected by use of a weather shield or nut.
- g. Drain assembly shall consist of two drain valves and have at least two drain openings to insure quick and complete drainage of hydrant, yet all parts of hydrant are to be capable of withstanding 200 ft. lbs torque applied in the fully open or fully closed position without damage.
- h. Hydrants shall be painted with two coats of white as a finished coat. Hydrant shall be painted after installation as directed by the Architect/Engineer.
- i. All hydrant operation stems shall be 1 1/2" round steel with copper sheathing for O-Ring protection and shall interchange with existing equipment. Only integral cast flanges in the upper and lower barrel shall be deemed suitable.
- j. Where indicated on the contract drawings, vertical shoe hydrants shall be installed as indicated in the detail drawing. These hydrants shall have a Standard ASNI B16.1 Class 125 flange inlet.

F. SERVICE LINES AND FITTINGS

- 1. Service lines shall be constructed of copper tubing of the sizes and the locations shown on the plans or as directed by the Architect/Engineer. Each service line shall be connected to the main with a corporation stop in accordance with standard practice and each service line shall be terminated with a curb stop.
- 2. Service lines shall be seamless copper tubing conforming to ASTM B-88-62, Type K.

3. All brass fittings shall comply with AWWA C800 and be constructed out of 85-5-5-5 red brass.

G. WATER METERS

1. Type 5/8 x 3/4 Inch, 5/8 x 1/2 Inch, and/or 1 Inch: Meters shall be of the magnetic drive, positive displacement with either an oscillating piston or nutating disc type. Piston oscillation and nutations shall comply with AWWA Standards C-700 as most recently revised.

- a. Size: Must conform to American Water Works Standard C-700 as most recently revised.
- b. Length: Must conform to American Water Works Standard C-700 as most recently revised.
- c. Casing: All meters shall have a non-corrosive bronze case with a separate measuring chamber which is easily removed in the repair shop and relatively tamper proof in the field. All meters shall have cast in the case in raised letters the size and direction of flow through the meter. Cast iron frost bottoms shall be provided on all of 5/8, 3/4 and 1 inch meters. All main cases shall be guaranteed against defects in materials and workmanship, in writing, for twenty-five years from date of receipt.

All meters shall have a serial number cast or stamped in both the meter lid and main case. Duplicate serial numbers will not be acceptable and all serial numbers should be continuous.

- d. External Bolts and Washers: All bolts and washers shall be of a corrosion resistant material and be easily removable from the main case.
- e. Registers: The Register must be of the straight reading totalizer type and have a large test or sweep hand. The Register must read in cubic feet. In piston type meter all reduction gearing shall be contained in a permanently hermetically sealed, tamperproof enclosure made of a corrosion resistant material and will be secured to the upper maincase by means of a locking device located in the interior of the meter so the Register cannot be removed externally.

Register Box is to be an integral part of the maincase, if disc type meter change gears must be accessible to facilitate easy calibration and the Register is to be located in a bronze Register Box mounted to the meter case by the use of seal screws. The Register shall be guaranteed in writing against defects in materials workmanship including hermetic sealing for twenty-five (25) years from date of receipt of the City.

Should the Register be fastened in place with screws, the screws

shall be safely wired and lead sealed in place.

The size and model of the meter shall be printed on the Register. All Registers of the same size and model shall be interchangeable. The effective reading height of Register numbers shall conform to AWWA Standards as latest revised, 3/16 inch in height minimum.

- f. Measuring Chamber: The Measuring Chamber of the piston type shall be manufactured from an acceptable polymer material and shall not be cast as a part of the maincase. All piston assemblies shall be interchangeable in all measuring chamber assemblies of the same size. The Chamber's division plate shall be stainless steel with a bonded rubber coating. The Chamber's bottom plate shall be held in place without the use of fasteners. The Measuring Chamber of the disc type meter shall be manufactured using acceptable polymer materials and shall be of the two-piece type consisting of removable top and bottom parts. Disc may be one-piece unit with the thrust roller operating on the division plate.
- g. Magnetic Coupling: The motion of the piston shall be transmitted to the hermetically sealed register through the use of a direct magnetic drive without any intermediate mechanical coupling. Driving magnet shall be mounted in the piston assembly and encapsulated in stainless steel. If meter is of the disc type, the motion of the disc will be transmitted to the register through the disc spindle contacting a driving 'dog' or control roller rotating the driver magnet that will cause a follower magnet in a separate chamber to actuate the gear train and register. Stuffing boxes are not acceptable.
- h. Strainers: All meters must be provided with a corrosion resistant Strainer which is easily removable from the meter without the meter itself being disconnected from the service line.
- i. Change Gears: It is preferred that all registers of a particular registration and meter size shall be identical and completely interchangeable. If Change Gears are utilized they shall be identical for each like size register and completely interchangeable.
- j. Accuracy and Head Loss Tests: Meters must conform to the AWWA Standards (latest revision) as they relate to flow and accuracy standards.
- k. Pressure Capability: Meter shall be capable of operating at working pressure up to 150 psi without leakage or damage to any parts. The accuracy shall not be affected when operating at this pressure due to any possible distortion.
- l. Guarantee: Bids shall be accepted only from those manufacturers

who are actively engaged in the manufacture of water meters with a minimum of five years satisfactory experience with water utilities with their respective meter. A list of at least five water utilities meeting this requirement shall be supplied with the bid. All meters shall be guaranteed against defects in materials for a period of one (1) year in writing with the exception of the register that shall be guaranteed as previously described. Bidder shall guarantee the meter accuracy to comply with AWWA Standards for a period of not less than three (3) years.

- m. Calibration Tests: The manufacturer shall at the request of the City provide sample meters for testing by the City along with the results of the manufacturer's calibration tests. The manufacturer shall include in writing a warranty concerning the accuracy of the meter bid for an anticipated life of 25 years from date of installation. Any and all meters tested after the bid award found to be in non-compliance to these specifications shall be replaced by the supplier at no cost to the City. This includes any shipping costs.
- n. Alternate Metering Chamber: As an alternate material the Metering Chamber may be of a bronze material of not less than 85% copper. The alternate material Metering Chamber shall be interchangeable with the polymer chambers in meters of like size and model. All accuracy, pressure requirements, and all warrantee requirements must be met.

H. METER BOXES AND LIDS

- 1. Cast Iron Meter Boxes shall be furnished with lids in accordance with the standard detail drawing.
- 2. Materials: Cast Iron used in the manufacturing of meter boxes and lids must conform to ASTM A-48-64 or latest revision for Class 30 gray iron castings.
 - a. Water meter boxes shall be made of clean, even grain, gray cast iron. Castings shall be smooth, true to pattern and free from projections, snaghole, warp and other defects, which would interfere with the use or impair the serviceability of the castings.
 - b. All covers shall fit smoothly and flush with outer rim of the box and shall have the words "*Water Meter*" embossed thereon.
- 3. Coatings: Finished castings shall be coated inside and outside with a bituminous coating in accordance with ANSI/AWWA C110-88 standard of latest revision. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun.

2.3 VALVES

A. General

1. Valves shall be located as shown on Drawings, and shall conform to the applicable specifications listed below. All flanged valves shall be in conformance with ANSI B16.1, Class 125, except where otherwise noted. Contractor shall submit shop drawings on all valves prior to manufacture.
2. Blow-off valves shall be installed with cast iron valves boxes and stems extending to the ground surface. Valve vaults shall be included for valves as shown on plans and constructed in accordance with the plans and specifications.
3. Valves shall turn counterclockwise or to the left to open.

B. Gate Valves

1. Gate valves shall be manufactured to meet or exceed the requirements of AWWA C509, latest revision.
2. The valves are to be non-rising stem with the stem made of cast, forged, or rolled bronze per AWWA C509. Stem seals shall be of the three O-ring type (2 upper and 1 lower).
3. The valve body, bonnet and bonnet cover shall be cast iron ASTM A126, Class B. Gate valves shall be hydrostatically tested in accordance with AWWA C509.
4. Valves shall have standard mechanical joint ends that comply with AWWA C111. Valves shall be attached to adjacent pipe with the Megalug Series 1100 mechanical joint restraint system.
5. All internal and external surfaces shall be shop-coated with fusion bonded epoxy coating.
6. Coating shall meet or exceed all applicable requirements of AWWA C550.
7. Wedges shall be fully encapsulated in molded rubber complying with ASTM D2000.
8. Valves shall be designed for manual operation with a valve wrench and shall be furnished with a Standard AWWA 2" nut.

C. Valve Boxes

1. Use service box of cast iron, extension type of the required length, with screw adjustment.
2. Boxes shall be five and one-quarter inch (5-1/4") shaft diameter with covers marked "WATER". Base sections to be selected in accordance with manufacturer's recommendation for valve size.

D. Tapping Valves, Sleeves and Crosses

1. Tapping valves and sleeves shall be special designed units suitable for making service taps on existing water mains.
2. The tapping valves shall comply with all applicable specifications in 2.03 B except that the valve shall have oversized seat rings, standard ANSI Class 125 flanged inlet and mechanical joint outlet. The outlet shall be suitable for direct attachment to a tapping machine adapter.
3. Tapping sleeves and crosses in the 4" through 12" sizes shall be mechanical joint ends, cast iron type with a working pressure rating of 150 psi.
4. The outlet(s) shall have flanged ends conforming to ANSI B16.1 Class 125.
5. Tapping sleeve for 14" through 24" sizes shall have full circle heavy steel with shop applied corrosion resistant primer and have a 150-psi pressure rating. The outlet shall be a steel flange having the same dimensions and drilling a Class 125 cast iron flange (ANSI B16.1).

2.4 MANHOLES

A. MANHOLE SECTIONS

1. Where shown on the drawings, the Contractor shall furnish and install reinforced concrete manholes with eccentric and concentric cones and flat slab bottoms or cast in place concrete bases conforming to the requirements of ASTM C-478. Joints for the precast manholes shall be of rubber type gasket conforming to the requirements of ASTM C443. Design of all sections shall be for H-20 loading.
2. Slabs for manholes may be either poured concrete or precast reinforced concrete. Concrete shall be as specified under Section 02530.
 - a. Precast manholes shall be as manufactured by Choctaw Products or equal. Designs shall be submitted for approval for precast reinforced concrete slabs.
3. Manhole frames and covers shall be for heavy-duty service of gray cast iron, meeting the requirements of ASTM A48, Class 25, with the covers marked "WATER".
 - a. The casting placed on concrete surface shall be set in full mortar beds composed of one-part masonry cement to two parts sand, by volume, based on dry materials, without other admixtures. Casting shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary.
4. Manhole steps shall be plastic coated corrosion resistant Perma Step 100-2 as manufactured by Utility Products of San Antonio, TX; "Surefoot" rubber encased steps as manufactured by Oliver Tire and Rubber Co., or equal.

5. Frames, covers and steps shall be of the best quality of tough gray pig iron of uniform quality, free from blowholes, shrinkage, distortion or other defects. All castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner.

PART 3: EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until satisfactory conditions are attained.

3.2 HANDLING

- A. Handle pipe accessories so as to ensure delivery in sound, undamaged condition.
- B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Architect/Engineer.

3.3 PIPE CUTTING

- A. Unless otherwise recommended by the pipe manufacturer and authorized by the Architect/Engineer, cut pipe with mechanical cutter only.

3.4 LOCATION RESTRICTIONS

- A. Right of Way
 1. The Contractor shall confine his construction operations to the easements shown on the Drawings, and shall use due care in placing construction tools, equipment, excavated materials, pipe line materials and supplies so as to cause the least damage to private property.
 2. If it is necessary or desirable that the Contractor use land outside of the temporary construction easements, the Contractor shall obtain consent from and execute a written agreement with the property owner.
 3. The Contractor shall not enter or occupy for any purpose with men, tools, equipment, construction materials, or with materials excavated from the pipe trench or roadway, private property outside the designated construction right-of-way without written permission from the Owner.
- B. Separation of Water and Sewer Mains
 1. Water mains shall be laid at least 10 feet horizontally and 18 inches vertically from any sanitary sewer or manhole. The bottom of the water line should be at least 18 inches from the top of the sewer line.

2. Where adequate horizontal and/or vertical separation cannot be maintained, the following requirements shall apply:
 - a. If the 10-foot horizontal separation between water and sewer lines cannot be maintained then the water line shall be constructed of ductile iron with water line joints located at the maximum distance possible from sewer line joints. PVC pipe may be used if protected by a steel casing.
 - b. Where the 10-foot horizontal and 18-inch vertical separation cannot be maintained, condition "a" above **MUST** be met **AND** the sewer line shall be constructed according to City standards.
 - c. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet (10') each side of the crossing, or provide pressure pipe with no joint located within 36" of the crossing.
 4. Cross water lines in cases above sewage force mains or inverted siphons at least 24" above the sewer line.
 5. Water lines should always be constructed above sewer lines.
 6. Do not place water lines in the same trench with sewer lines or electric wiring.
- C. Minimum Cover
1. Minimum depth of cover below finish ground surface for water lines is 30" above the top of the water line.

3.5 PLACEMENT

- A. General: Pipe installation shall comply with generally accepted standards of good workmanship, including applicable AWWA and industry standards, along with, but not limited to the following:
1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the Architect/Engineer.
 2. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
 3. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
 4. Take up and relay pipe that has the grade or joint disturbed after laying.
 5. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.

6. Securely close open ends of pipe, fittings, and valves when work is not in progress.
7. Where any part of coating or lining is damaged, repair to the approval of the Architect and at no additional cost to the Owner.

B. Connections

1. Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

C. Sleeves:

1. Where the pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.6 JOINTING

A. Asbestos cement pipe:

1. Install couplings in accordance with AWWA C603.
2. Install heavy couplings for service line connections in accordance with the manufacturer's recommendations.

B. Other joints:

1. Cast iron pipe, ductile iron pipe, mechanical joints and push-on joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.
2. Make connections between different types of pipe and accessories with transition fittings.
3. Rubber gaskets: handle, lubricate where necessary, and install in strict accordance with the manufacturer's recommendations.

3.7 SETTING VALVES AND VALVE BOXES

A. General

1. Center valve boxes on the valve, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet (4') on all

sides, or to the undisturbed trench face if less than five feet (5').

3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:

1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

3.8 THRUST BLOCKS

A. General

1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees, and bends deflecting 22-1/2° or more either vertically or horizontally, and on water lines 6-inches in diameter or larger.
2. Provide concrete thrust blocking with a compressive strength of 3,000 psi in 28 days.

3.9 TESTING AND INSPECTING

- A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Architect/Engineer.

B. Hydrostatic tests

1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the Architect/Engineer.
2. Test all water supply lines, including irrigation and fire protection lines, using methods approved by the City.

C. Pressure tests:

1. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled, leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping for a hydrostatic pressure of 200 psi.
2. Open and close each valve several times during the test.
3. Carefully examine exposed pipe, joints, fittings, and valves.

4. Replace or remake joints showing visible leakage.
5. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings and valves. Replace with sound material and repeat the test until results are satisfactory.
6. Make repair and replacement without additional cost to the Owner.

D. Leakage Test:

1. Conduct leakage test after the pressure test has been completed satisfactorily.
2. Subject water lines to a pressure of 200 psi for no less than two (2) hours.
3. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
4. No piping installation will be accepted until the leakage is less than the number of gallons per hour indicated below:

<u>Diameter (in.)</u>	<u>Leakage (gal)</u>
2	0.0153
3	0.0231
4	0.0306
6	0.0458
8	0.0610
10	0.0765

E. Disinfection

1. After completion of the construction and pressure testing of water distribution lines, they shall be flushed and disinfected using at least a 50 mg/l free chlorine solution for 24 hours or as described in the latest revision of AWWA C651.
 - a. Disposal of Chlorinated Disinfecting Water
 - (1) All chlorinated waters shall be required to be dechlorinated to a residual concentration of no greater than 0.5 mg/l total residual chlorine prior to disposal to water courses, on land or through storm or sanitary sewers.
 - (2) The method of disposal shall be in conformance with all requirements of the Mississippi Bureau of Pollution Control, the Mississippi Department of Health, and any and

all other state, federal or local agencies holding jurisdiction. The Contractor will be required to provide written confirmation from these agencies that the method of disposal is acceptable and to provide any licenses or permits required for the discharge of the dechlorinated water. The Contractor will be required to comply with all requirements of any agencies having jurisdiction whether additional to or different from those included herein, all at no additional cost to the Owner.

- (3) All costs associated with disposal of chlorinated disinfecting water shall be incidental to the cost of the pipeline.
2. Contractor shall arrange for at least one microbiological water sample to be collected by a representative of the Mississippi State Department of Health (MSDH), the Licensed Professional Architect or Engineer in charge of the project, or the Certified Operator for the system from every dead end line and every major looped line.
3. Water being collected for testing shall not have a chlorine residual higher than is normally maintained in other parts of the distribution system.
4. No chlorine shall be present which is a result of line disinfection.
5. A sample showing "No Coliform Present" shall constitute a satisfactory sample when analyzed by the Mississippi State Department of Health (MSDH) Environmental Laboratory or a laboratory certified by the MSDH.
6. Furnish two copies of a Certificate of Disinfection to the Architect/Engineer.

END OF SECTION

SECTION 02530 SANITARY SEWER

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Install sanitary sewerage system, including gravity sewer, force mains and accessories described herein and as shown on the Drawing.

1.2 SUBMITTALS

- A. Shop Drawings: Submit detailed shop drawings in accordance with Division I Sections for submittals.
- B. Product Data: Within 45 calendar days after the Contractor has received the Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when reviewed and approved by the Architect/Engineer, will become the basis for accepting or rejecting the actual installation procedures used on the Work.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Provide pipe and associated materials of the size indicated on the Drawings and meeting the following requirements.
 - 1. Polyvinyl chloride pipe (PVC) and fittings (GRAVITY SEWER):
 - a. Use extra strength, minimum of SDR 35.
 - b. Material shall comply with ASTM D3034.
 - c. Pipe lengths shall not exceed 20 feet and provisions shall be made at each joint to accommodate expansion and contraction.
 - d. All pipes and fittings shall be joined by means of an integral wall bell and spigot and sealed with a rubber gasket. This joint shall be capable of withstanding an internal hydrostatic pressure of 25 psi for 1 hour with no leakage.
 - e. In every instance where pipe enters or leaves a manhole, a fitting shall be provided which will accommodate expansion and contraction of the pipe, release strain on the pipe caused by

differential settlement between pipe and manhole, and provides a rubber ring water seal between pipe and manhole. Where indicated, fittings shall also be provided for stubouts and future connections and stub out shall be sealed with PVC plug. Fittings shall be included in the price of the manholes.

- f. Install PVC pipe in accordance with ASTM D2321.
2. Polyvinyl chloride pipe (PVC) and fittings (FORCE MAIN):
- a. PVC pipe for force mains shall be provided as shown on the plans.
 - b. Conform to the requirements of AWWA C900 "Standard for Pressure Pipe with Cast Iron Pipe Outside Diameter"
 - c. Class 150 with an SDR of 18 or heavier.
 - d. Pipe joints shall be integral bell and spigot type with rubber ring sealing gasket.
 - e. Standard lengths shall be 20 feet except that 15 percent of total footage may be random length of not less than 10 feet each.
 - f. Fittings for PVC Force Main
 - (1) Cast iron or ductile iron conforming to ANSI/AWWA C110/A21.10.
 - (2) Fittings shall have a transition gasket specifically designed to accommodate the outside diameter of the force main.
 - (3) Tapping saddles shall be used for insertion of corporation stops or other outlets for testing of force mains.
3. Ductile Iron
- a. Minimum wall thickness shall be as specified in ASTM A746 for thickness Class 52.
 - b. Ductile iron gravity sewer shall be mechanical joint or push-on joint, unless otherwise specified, conforming to ASTM A746.
 - c. Ductile iron pipe and fittings shall have a cement mortar lining conforming to ANSI/AWWA C104/A21.4.
 - d. Cutting of ductile iron pipe shall be by saw, cutter, abrasive wheel or other approved method. In no case shall ductile iron pipe be cut by burning.
4. Reinforced Concrete Pipe (RCP) for Gravity Sewers

- a. Conform to ASTM C76.
- b. RCP for cuts of 12 feet or less shall meet the strength requirements for ASTM C76, Class III with wall thickness "B" or greater.
- c. RCP for cuts 12 feet to 18 feet shall meet the strength requirements for ASTM C76, Class IV, with wall thickness "B" or greater.
- d. RCP for cuts in excess of 18 feet shall meet the strength requirements for ASTM C76, Class V, with wall thickness "B" or greater.
- e. Pipe bedding shall be Class B as shown in the Concrete Pipe Design Manual, prepared by the American Concrete Pipe Association.
- f. Cement for all concrete pipes shall conform to ASTM C150, Type II.
- g. Fine and coarse aggregate shall conform to the requirements of the latest ASTM C33, and shall be made from 100 percent calcareous rock (limestone).
- h. Concrete pipe shall be furnished with joints of the round rubber gasket type using the bell and spigot design, conforming to ASTM C443.

2.2 CONCRETE MANHOLES

A. Precast Concrete Manholes:

- 1. Provide reinforced precast concrete manhole sections complying with ASTM C478, with a minimum wall thickness of 5 inches, except use Portland cement as specified below.
- 2. Provide joints of mortar, with approved mastic or rubber gasket, or an approved combination of those types.
- 3. Provide precast units of concrete rings and eccentric cone section, with ladder rungs cast into the units.

B. Portland cement: Comply with ASTM C150, Type II.

C. Concrete: 3,500 psi concrete or as specified in Section 03300.

D. Mortar: Comply with ASTM C270, Type M.

2.3 LININGS FOR PIPES AND MANHOLES

- A. Ceramic Epoxy Lining for Ductile Iron Pipe
 - 1. Ductile iron pipe shall be lined with a high build protective lining of ceramic epoxy.
 - 2. Material used to line the pipe and fittings shall have a successful history of protecting pipelines in service.
- B. Ceramic Epoxy Lining for Concrete Pipe and Manholes
 - 1. Coal tar epoxy as approved.
- C. PVC Lining for Concrete Pipe
 - 1. Basic liner sheets shall have a 0.065-inch minimum thickness
 - 2. Material shall be a combination of polyvinyl chloride resin, pigments, and plasticizers, specially compounded to remain flexible.

2.4 FRAMES AND COVERS

- A. Ferrous castings shall be of uniform quality, free from defects.
- B. Metal used in the manufacture of castings shall conform to ASTM A-48-83 Class 35B for Gray Iron or ASTM A-536-80 Grade 65-45-12 for Ductile Iron.
- C. Castings shall be coated with coal tar pitch varnish.

2.5 CLEANOUTS

- A. Provide cleanouts as required and where shown on the Drawings
 - 1. Provide traffic weight covers and frames where cleanouts are within pavement.
 - 2. Where cleanout is within a graded or lawn area, construct as shown on the Drawings.

2.6 OIL/WATER SEPARATOR

- A. 600 Gallon (2725 liter) oil/ water separator specifications:
 - 1. Treatment flow rate in G.P.M.: 50 G.P.M (230 liters per minute)
 - 2. Operating temperature range: 5 degrees Celsius >
 - 3. Influent oil specific gravity: < .90
 - 4. Influent hydrocarbon concentration: < 80,000 PPM

5. Effluent quality: < 15 mg./liter TEH and < 15mg./liter TSS in one day composite
 6. Maximum oil storage volume: 1550 liters (340 gallons)
 7. Recommended oil storage volume: 910 liters (200 gallons)
 8. Sludge storage capacity: .36 cubic meters (12.75 cubic feet)
 9. Scour at recommended oil storage volume: < 15 mg./liter
- B. After oil/ water separator has been set up as per details and specifications, fill oil/ water separator with fresh water until invert of outlet tee is reached.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATION, TRENCHING, AND BEDDING

- A. Excavation shall include the removal and disposition of all materials necessary to expose a firm, even foundation and sufficient to permit the installation and bracing of forms.

3.3 SETTING FORMS

- A. Forms shall be of wood or metal, straight, free from warp, of sufficient strength to resist the pressure of the concrete without springing when concrete is placed against them. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. Forms shall be cleaned and oiled before placing concrete against them.

3.4 INSTALLING PIPE

- A. General:
2. Install all pipes accurately and to line and grade shown unless otherwise approved by the Architect/Engineer. Pipes that are not laid correctly shall be removed and relaid by Contractor at his expense.
 - a. Sewer shall be located no closer than ten feet (10') from a water supply main or service line.
 - b. Where the bottom of the water pipe will be at least 12" above the

top of the sewer pipe, the horizontal spacing shall be a minimum of six feet (6').

- c. Where the gravity flow sewers cross above water lines, fully encase the sewer pipe for a distance of ten feet (10') on each side of the crossing; or
 - d. Use acceptable pressure pipe with no joint closer horizontally than three feet (3') from the crossing.
- 3. Ensure that water level in trench is at least six (6) inches below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete. Failure to adequately dewater the trench shall be just cause to render the pipe installation unacceptable.
 - 4. Begin at downstream end and proceed laying pipe along uniform slopes toward higher elevations.
 - 5. Place bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by Architect/Engineer.
 - 6. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom. Permissible deflections at joints shall not exceed 75 percent of the amount allowed by manufacturer.
 - 7. All pipe and fittings shall be carefully examined for cracks, damage or other defects while suspended above the trench before installation. Defective materials shall be immediately removed from site and replaced by new materials at no additional cost to the Owner.
 - 8. Architect/Engineer shall inspect conduit before any backfill is placed. Any conduit found to be out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced. After the conduit is installed and the joints properly cured, the pipe shall be backfilled.

3.5 WYE BRANCHES

- A. Provide wye branches where sewer connections are indicated or required.
 - 1. Where joining an existing line, join by placing a saddle over the line, and make connection in a manner that will not obstruct or interfere with the existing flow.
 - 2. When conditions are such that connection pipe cannot be supported adequately on undisturbed earth or compacted fill, encase the pipe in a concrete backfill, or support on a concrete cradle.

3.6 MANHOLES

A. General

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.
2. Make changes in direction of flow with a smooth curve having as large a radius as the size of the manhole will allow.
3. Make changes in size and grade of channels smoothly and evenly.
4. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened.
5. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot or more than 2" per foot.
6. Prevent free drop inside the manholes exceeding 18" measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels.
7. Construct drop manholes whenever the free drop otherwise would be greater than 18 inches.

B. Manhole rungs:

1. Provide each manhole with individual wall-mounted rungs fabricated of aluminum, plastic-covered steel, or galvanized steel.
2. Comply with requirements of the City Engineering Department.

C. Jointing and plastering:

1. Completely fill mortar joints, and leave smooth and free from surplus mortar on the inside of the manhole.

D. Frames and covers: Unless otherwise shown on the Drawings, set frames and covers as follows:

1. In paved areas: Top of cover will be flush with the finished pavement.
2. In unpaved areas: 2" higher than finish grade.

3.7 MANHOLE OVER EXISTING PIPE

- #### **A.**
- Construct new manhole as specified, breaking upper half of existing pipe after base of manhole is completed so as not to obstruct flow of the existing pipe.

3.8 BUILDING CONNECTIONS

- A. Terminate building connections no closer than five feet (5') from the exterior wall, or where shown on the Drawings.
- B. Provide temporary closures at terminals where the building pipe is not installed.
 - 9. Place marker post at grade end of plugged line.
 - 10. Where building piping has been installed, make connection to the building piping system.

3.9 INSTALLATION OF FORCE MAINS

- A. Force mains shall be constructed to the alignment and depth required by the plans or to meet field conditions.
- B. Force mains 16" inches and larger shall have a minimum cover of 48 inches. Force mains smaller than 16 inches shall have minimum cover of 30 inches.
- C. Trench width shall be at least 12 inches greater than the nominal diameter of the pipe and the maximum clear width of the trench shall not be more than 36 inches greater than the pipe diameter.
- D. The trench shall have a flat bottom with bell holes of ample dimension to allow jointing and so that the barrel of the pipe will have a bearing for its full width.
- E. All pipe, fittings, etc., shall be lowered into the trench by means of derricks, ropes, or other suitable tools, and under no circumstances shall pipe be dropped into the trench.

3.10 TESTING AND INSPECTION

- A. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been inspected and tested, and has been approved by the Architect/Engineer.
- B. Leakage tests:
 - 1. Test lines for leakage by exfiltration tests.
 - a. Prior to testing for leakage, backfill the trench to at least the lower half of the pipe.
 - b. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.
 - 2. Water exfiltration tests:
 - a. Test each section of sewer line between successive manholes by

closing the lower end of the sewer to be tested, and the inlet sewer of the upper manhole, using stoppers.

- b. Fill the manhole and pipe with water to a point four feet (4') above the invert of the sewer at the center of the upper manhole; or, if groundwater is present, four feet above the average adjacent groundwater level.

11. Water infiltration test:

- a. If, in the opinion of the Architect/Engineer, excessive groundwater is encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
- b. Close the end of the sewer at the upper structure sufficiently to prevent the entrance of water.
- c. Discontinue pumping of groundwater for at least three (3) days, then test for infiltration.
- d. Infiltration into each individual sewer reach between adjoining manholes shall not exceed that allowed for the exfiltration test.

12. Provide and use measuring devices approved by the Architect/Engineer.

13. Provide water, materials, and labor for making required tests.

14. Make tests in the presence of the Architect/Engineer, giving the Architect at least three (3) days advance notice of being ready for test observation.

C. Submit test data to the Architect/Engineer for review and approval.

END OF SECTION

SECTION 02553 NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This work shall consist of the installation of gas service from the main to the building and site distribution. This section provides general information regarding the installation of site natural gas distribution mains, services and appurtenances.

1.02 REFERENCES

- A. The following organizations publish materials governing the work of this section:

American Petroleum Institute (API)
American Water Works Association (AWWA)
American Society of Mechanical Engineers (ASME)
American Society of Testing and Materials (ASTM)
Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
The Society for Protective Coatings (SSPC)
U S Department of Defense (DOD)

1.03 SYSTEM DISTRIBUTION

- A. The gas distribution system includes natural gas piping and appurtenances from point of connection with existing system as indicated to a point approximately five (5) feet from the building.

1.04 QUALITY ASSURANCE

- A. Materials and equipment shall conform to ASME B31.8 to the extent specified herein, to local utility requirements, and to other requirements specified.

PART 2 – PRODUCTS

2.01 STEEL PIPE AND FITTINGS (SERVICE LINES)

- A. API Spec 5L, Grade B or X42, Schedule 40. Coat pipe and fittings for underground lines. Do not coat pipe and fittings for above ground lines. Butt weld fittings shall be wrought steel, ASME B16.9, Schedule 40.
- B. Threaded fittings shall be black malleable iron or steel.
- C. Do no install close nipples and unions underground.
- D. Pipe and fittings shall have welded joints.

2.03 POLYETHYLENE PIPE AND HEAT FUSION FITTINGS

- A. Conform to ASTM D 2513. Minimum wall thickness shall be as specified in ASTM D 2513. PE pipe and fittings shall have joints as specified for gas distribution main piping.

2.04 GAS SERVICE VALVES AND ACCESSORIES

- A. Valves
 - 1. Provide plug or ball valves for service lines as specified for gas main valves.
- B. Valve Boxes for Curb Cocks
 - 1. Provide each valve on buried piping with a valve box as specified for gas main valves.

PART 3 – EXECUTION

3.01 GENERAL

- A. The gas main or service lines shall be installed by the gas utility company having jurisdiction.
- B. Contractor shall make no repairs, alterations or connections to, or perform any work on, the utility company's gas supply system without authorization by the Gas Utility Company.
- C. It is the Contractor's responsibility to notify the one-call system and initiate a request to locate underground facilities a minimum of two working days prior to excavation.
- D. Do not install gas piping in the same trench with other utilities. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be two (2) feet.
- E. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.
- F. No person, unless in the employ of the Gas Utility, shall repair, alter, open, or make connections to the service or perform any work on any parts of the Utility's gas supply system.

3.02 SITE CONDITIONS

- A. Contractor shall determine that the site is ready to receive the work of this section.

- B. Pipe, fittings, valves and accessories will be carefully inspected by the installer before and after installation and those found defective will be rejected. Pipe and fittings shall be free from fins and burrs.
- C. The areas in which gas facilities are to be located shall be easily accessible and allow for good working conditions. Dirt piles, debris, construction materials, etc. shall be removed from the gas route and trench. Trenches containing water must be pumped out by the Contractor before installation of the pipe.
- D. Stakes showing the center line and final elevation of roads and streets shall be installed and maintained until construction is complete.
- E. If required by the Gas Utility, the Contractor shall execute and deliver to the Utility satisfactory written permanent easements or rights of way. Upon request, the Utility will provide the appropriate form for this purpose.
- F. Water mains and laterals, sewers and storm drains, shall be installed prior to the installation of the gas mains and services.
- G. Contractor shall notify the Gas Utility Company at least seven (7) days in advance of the requested installation date, when all of the above requirements have been accomplished.

3.03 INSTALLATION OF PIPELINES

- A. Pipe Laying
 - 1. Provide proper facilities for lowering sections of pipe into trenches.
 - 2. Cut pipe accurately to measurements established at the site and work into place without springing or forcing.
 - 3. Replace pipe or fittings that do not allow sufficient space for proper installation of jointing materials with pipe or fittings of proper dimensions.
 - 4. Grade pipe in straight lines, taking care to avoid the formation of dips and low points. Support pipe at proper elevation and grade, taking care to secure firm and uniform support.
 - 5. Wood support blocking will not be permitted.
 - 6. The full length of each section of pipe and all fittings shall rest solidly on the pipe bedding, with recesses excavated to accommodate joints and couplings.
 - 7. Provide anchors and supports where indicated. Make provision for the expansion and contraction of pipe lines as indicated.
 - 8. Gas mains shall have a minimum earth cover of 30 inches.
- B. Installation of Valves for Gas Mains

1. Install valves in accordance with applicable installation requirements specified in ASMD B31.8 and as indicated.
2. Install valve stems on buried piping vertically with a minimum of 8 inch clearance from stem top to finished grade.

3.04 GAS SERVICE CONNECTIONS

- A. The gas service will be installed by the utility company having jurisdiction.
- B. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main as close to the top as possible. Service connections shall not be made lower than the midpoint of the gas main.
- C. Gas service lines shall have a minimum of eighteen (18) inches of cover below finish ground.
- D. The Gas Utility shall install the gas service riser for residential services at a minimum of six (6) inches from any building wall.
- E. Metering equipment layout and service installations for commercial and industrial installations may vary. Utility company standards will be used as a guide for layout and installation.
- F. Gas service will be supplied to each building or structure through a single service pipe. Areas served by more than one service line must be separated by an approved firewall.
- G. The Gas Utility's service pipe shall terminate at the outlet piping of the company's gas meter or at the gas pressure regulator. The Gas Utility shall have the right to specify the location of the gas service connection. Contractor shall consult with the gas utility company regarding the location of the service connection prior to starting construction.
- H. The route of the gas service and entrance to the building shall be at the closest point of supply.

3.05 GAS SERVICE PIPE JOINTS

- A. Steel Pipe: Make joints for steel service line piping as specified for steel distribution main piping.
- B. PE Pipe or Tubing: Make joints for PE pipe or tubing and fittings in accordance with ASME B31.8 and the recommendations of the pipe manufacturer.

3.06 PRESSURE CONTROL EQUIPMENT

- A. Pressure control equipment will be located outside of the building, unless otherwise located by the Gas Utility Company.
- B. Where piping may be subject to vehicular damage, three (3) inch diameter steel pipe posts (grout-filled) or bollards shall be placed by the Contractor around pressure control and metering equipment.

3.07 GAS METERS

- A. Utility will furnish and install all meters required for billing of gas delivered to the building or structure.
- B. All meters shall be installed outside of the building. The Gas Utility shall designate or approve all meter locations.

3.08 FINAL CLEAN-UP

- A. Upon completion of the work, remove and dispose of excess spoil and leave the areas in a clean condition. Restore service line trenches as near as possible to the original appearance and condition.

END OF SECTION

SECTION 02630 STORM DRAINAGE

1.1 SCOPE OF WORK

- A. The work of this section provides of the construction of storm drainage system, including pipes, inlets, catch basins, junction boxes, manholes, conflict boxes, and other structures as shown on the Drawings.

1.2 SUBMITTALS

- A. Shop Drawings: Submit detailed shop drawings for curb inlets and catch basins in accordance with Division I Sections for submittals.
- B. Product Data: Within forty-five (45) calendar days after the Contractor has received the Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when reviewed and approved by the Architect/Engineer, will become the basis for accepting or rejecting the actual installation procedures used on the Work.

1.3 REFERENCE STANDARDS

- A. American Society of Testing and Materials (ASTM)
 - 1. ASTM C 14, Concrete Sewer, Storm Drain and Culvert Pipe
 - 2. ASTM C 76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - 3. ASTM C 188, Concrete Pipe for Drainage.
 - 4. ASTM C 150, Portland Cement.
 - 5. ASTM A 185, Welded Steel Wire Fabric for Concrete Reinforcement.
 - 6. ASTM A 496, Deformed Steel Wire for Concrete Reinforcement.
 - 7. ASTM A 497, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - 8. ASTM M252, Corrugated Polyethylene Drainage Tubing.
 - 9. ASTM M294, Corrugated Polyethylene Pipe, 12-in to 36-in Diameter.

10. ASTM F405, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
11. ASTM F667, Large Diameter Corrugated Polyethylene Tubing and Fittings.
12. ASTM 810, Smooth Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. REINFORCED CONCRETE PIPE (RCP)

1. ASTM C 76, Class III, standard strength reinforced concrete culvert pipe conforming to requirements as set out in Table III of AASHTO M-170.
 - a. Round Pipe: All joints shall utilize rubber gasket joints designed to provide a watertight joint. Gaskets shall meet the requirements of ASTM C 443.
 - b. Pipe ends shall be normal to the walls and center of pipe.
 - c. Cement for Concrete Work: ASTM C 150 or ASTM C 595.
2. ASTM C76, Class IV, extra strength reinforced concrete culvert pipe conforming to requirements as set out in Table 4 of AASHTO M-170.

B. POLYVINYL CHLORIDE PIPE (PVC)

1. PVC gravity pipe and fitting shall be suitable for use as a gravity sewer conduit and shall conform to ASTM D 3034 (SDR 26), latest revision, minimum pipe stiffness, 115 psi. All fittings and accessories shall have bell and spigot configurations identical to that of the pipe.
2. Joints for PVC sewer pipe shall be integral bell gasketed joint designated so that when assembled, the elastomeric gasket inside the bell is compressed radially on the pipe spigot to form a positive seal. The joint shall be so designated to avoid displacement of the gasket when installed in accordance with the manufacturer's recommendation. Joints shall conform to ASTM D 3212, latest revision. Gaskets shall conform to ASTM F 477, latest revision.

2.2 DRAINAGE STRUCTURES

A. General:

1. Construct manholes, inlets and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings, and with fixed ladder rungs where indicated on the Drawings or required by codes.
2. Individual wall-mounted aluminum, plastic-covered steel, or galvanized steel rungs are acceptable.

B. Materials

1. Concrete - 3,500 psi concrete.
2. Reinforcement - Deformed Grade 40 or 60 billet steel, complying with ASTM A 615.
3. Mortar for pipe joints and connections to other drainage structures, and manhole construction:
 - a. Comply with requirements of ASTM C270, Type M, except the maximum placement time shall be one hour.
 - b. Hydrated lime complying with ASTM C141, Type B, may be added to the sand-cement mixture in an amount equal to 25% of the volume of cement used.
 - c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.
4. Precast reinforced concrete manholes:
 - a. Comply with ASTM C478, precast rings and cone sections.
 - b. Fully bed the joints between precast concrete risers and tops in mortar, and smooth both interior and exterior surfaces uniformly.
 - c. Contractor may select this option in lieu of brick manhole.
5. Precast concrete catch basins:
 - a. Provide reinforced and bottom open for field pouring to ensure slope through the structure.
 - b. Contractor may select this option in lieu of cast-in-place concrete or brick catch basins.

6. Covers, Grates and Frames:
 - a. Ferrous castings shall be of uniform quality, free from defects. Metal used in the manufacture of castings shall conform to ASTM A-48-83 Class 35B for Gray Iron or ASTM A-536-80 Grade 65-45-12 for Ductile Iron.
 - b. Round frames and covers shall have continuously machined bearing surfaces to prevent rocking and rattling.
 - c. All grates shall be bicycle safe.

PART 3 – EXECUTION

3.1 EXCAVATION, TRENCHING, AND BEDDING

- A. Excavation shall include the removal and disposition of all materials necessary to expose a firm, even foundation and sufficient to permit the installation and bracing of forms.
- B. Bedding
 1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
 2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.
 3. Tamp bedding where necessary.

3.2 SETTING FORMS

- A. Forms shall be of wood or metal, straight, free from warp, of sufficient strength to resist the pressure of the concrete without springing when concrete is placed against them. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. Forms shall be cleaned and oiled before placing concrete against them.

3.3 INSTALLING PIPE

- A. General:
 1. Install all pipes accurately and to line and grade shown unless otherwise approved by the Architect/Engineer. Pipes that are not laid correctly shall be removed and relaid by Contractor at his expense.
 2. Ensure that water level in trench is at least six (6) inches below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete. Failure to adequately dewater the trench shall be just cause to render the pipe installation unacceptable.

3. Begin at downstream end and proceed laying pipe along uniform slopes toward higher elevations.
4. Place bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by Architect/Engineer.
5. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
6. Permissible deflections at joints shall not exceed 75 percent of the amount allowed by manufacturer.
7. All pipe and fittings shall be carefully examined for cracks, damage or other defects while suspended above the trench before installation. Defective materials shall be immediately removed from site and replaced by new materials at no additional cost to the Owner.
8. Architect/Engineer shall inspect conduit before any backfill is placed. Any conduit found to be out of alignment, unduly settled, or damaged should be taken up and relaid or replaced. After the conduit is installed and the joints properly cured, the pipe shall be backfilled.

3.4 JOINTS

A. General:

1. Clean completely all jointing surfaces and adjacent areas immediately before making joint.
2. Lubricate and adjust gaskets and "O"-rings as recommended by manufacturer.
3. After "O"-rings are compressed and before pipe is brought fully home, each gasket shall be carefully checked for proper position around full circumference of the joint.
4. Conform to AWWA C111 and to manufacturer's recommendations pertaining to jointing pipe.

B. Joining pipe of different materials: Provide fittings or couplings made for the pipe material being jointed, or provide a concrete collar as approved by the Architect/Engineer.

C. Joining pipe of different sizes:

1. Provide reducer fittings to the larger pipe.
2. Where pipes are of different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.

3. Use saddle connection when branch lines join a main or collector main.
4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.5 DRAINAGE STRUCTURES

- A. Install drainage structures in accordance with the Drawings and with the manufacturers' recommendations as approved by the Architect/Engineer.

3.6 CASTINGS, GRATINGS, AND FITTINGS

- A. All castings and gratings shall be carefully removed handled. Injurious cracks, chips, surface mars, etc., which render them unsuitable for use or unsightly shall be cause for rejection, and if so directed, they shall be replaced.
- B. The castings, gratings, and fittings shall be placed as indicated on the plans, or as directed, to line to grade, and in such a manner that subsequent adjustments will not be necessary.
- C. When castings or gratings are to be set in concrete or cement mortar, all anchors or bolts shall be in the correct place and position before the concrete or mortar is placed, and they shall not be disturbed while the concrete or mortar is hardening.
- D. Castings and gratings placed on previously constructed masonry shall be set in mortar beds or anchored to the masonry as shown on the plans. The bearing surface of the original masonry shall present an even surface and conform to the line and grade so that the entire face of the back of the casting will come in contact with the masonry.
- E. Castings and gratings shall be set firm and snug so that they will not rattle, shake, or move unnecessarily.
- F. Gray iron castings for manholes and catch basins shall be thoroughly coated with an approved coal tar pitch varnish.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for precast polymer, pre-sloped interior surface trench drain systems. See Plumbing Drawings for location.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings for assembly and installation of sloped trench drain system including covers, anchors, and related components of the system. Include plans, elevations, part numbers, anchorage, and details indicating connections to adjoining work.
- C. Submit installer qualifications.

1.3 QUALITY ASSURANCE

- A. Trench drain manufacturer shall have a minimum of 5 years experience in the manufacturing polymer trench drain systems and shall have a minimum of 5 installations similar to the work of this project.
 - 1. Trench drain manufacturer shall be responsible for designing the trench drain system layout to function and fit as indicated on drawings.
 - 2. Trench drain manufacturer shall produce detailed, step by step, installation instruction manuals and offer installation assistance including online instructional videos.
- B. Trench drain installer shall have a minimum of 5 years experience in the installation of polymer trench drain systems and shall have a minimum of 5 installations similar to the work of this project.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Deliver, store, and handle products in strict accordance with the manufacturer's directions and recommendations.

1.5 PROJECT CONDITIONS

- A. Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings.

1.6 COORDINATION

- A. Coordinate the work of this section with work of other sections including but not limited to:
 - 1. Section 03100 - Concrete Formwork
 - 2. Section 03200 - Concrete Reinforcement
 - 3. Section 03300 - Cast-in-Place Concrete
 - 4. Related Division 15 Plumbing specification sections.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. The surface drainage system shall be manufactured by ACO Polymer Products, Inc. Products of other manufacturer's offering products of same quality, durability, function, and ease of installation are acceptable upon review and approval by Architect.
 - 1. Drain system shall be KlassikDrain, K100 galvanized edge rail complete with QuickLok locking.
 - a. The nominal clear opening shall be 4 inches with overall width of 5.12 inches. Pre-cast units shall be manufactured with an invert slope of 0.5 percent minimum and have a wall thickness of at least 0.50 inch. Each unit will feature a partial radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring keys on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. A galvanized steel edge rail shall be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 3/32 inch thick.
 - b. Drainage channels shall be positioned sequentially in numerical order creating a continuously sloped channel run.
 - 2. Grate shall be Type 478Q longitudinal ductile iron grate with 'QuickLok' locking bar. The overall width shall be 4.85 inches and overall length shall be 19.69 inches. Slots measure at a maximum of 0.28 inch.
 - a. Grate shall be E-coated for improved rust resistance.
 - 3. Provide QuickLok grate removal tool.

2.2 ACCESSORIES

- A. Provide trench drain accessories as required for a complete and functioning

installation as indicated on drawings including but not limited to end caps, outlets, installation devices, templates, adapters, strainers,

2.3 MATERIALS

- A. The trench system body shall be manufactured from polyester polymer concrete with the minimum properties as follows:
 - 1. Compressive strength: 14,000 psi
 - 2. Flexural strength: 4,000 psi
 - 3. Water absorption 0.07%
 - 4. Materials shall be:
 - a. Frost proof
 - b. Salt proof
 - c. Dilute acid and alkali resistant
- B. Grates shall be manufactured from ductile iron and have minimum properties as follows:
 - 1. Independently certified to meet Load Class E to EN 1433 - 135,000 lbs - 2,788 psi.
 - 2. Ductile iron shall meet ASTM A 536-84 - Grade 65-45-12.
 - 3. Intake area of 22.5 square inches per half meter of grate.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions under which the trench drain system will be installed and report any conditions detrimental to the proper installation of the system.

3.2 INSTALLATION

- A. Install products in strict accordance with the manufacturer's printed installation instructions, online videos, and approved shop drawings.
- B. Trench drain system shall be completely enclosed on bottom and sides with concrete to a depth of at least 8 inches.
- C. Concrete shall be screeded and finished flush to the top surface of the trench drain system. Channel edge and grate shall be level with adjacent concrete surface and shall not create ponding of water outside of channel.

- D. Channel to channel joints shall be sealed with flexible sealant approved by manufacturer.

3.3 CLEANING AND PROTECTING

- A. Remove any debris in system and grate rebate. Ensure outlet pipes are clear.
- B. Flush trench run to check for pipe work blockages, unblock if necessary.
- C. Install grates in proper position ensuring they are securely locked down.

END OF SECTION

SECTION 02741 HOT MIX ASPHALT PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Provide hot-mix asphaltic concrete paving, wheel stops, and pavement marking where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 SUBMITTALS

- A. Submit the following in accordance with Division I Sections regarding submittals:
 - 1. Certified Mix Designs
 - 2. Certified Test results for all material gradation.
- B. Submittals for asphaltic concrete paving shall be provided to the Architect/Engineer no later than fourteen (14) days prior to starting the paving work. No paving operations shall commence until mix design has been approved in writing by the Architect/Engineer.

1.03 REFERENCE STANDARDS

- A. In addition to complying with all pertinent codes and regulations, comply with the referenced or applicable portions of the Mississippi Standard Specifications for Road and Bridge Construction, Mississippi State Highway Department, 2004 Edition or current English edition (hereinafter referred to as the MDOT Specifications).

1.04 PRODUCT HANDLING

- A. Protection
 - 1. Use all means necessary to protect bituminous concrete pavement materials before, during and after installation and to protect the installed work and materials of all other trades.

1.05 TESTING

- A. Materials under this section shall be tested by an independent testing laboratory provided and paid for by the Owner for conformance to the approved mix design.
 - 1. Perform coring sample collection and density tests.
 - 2. Provide three (3) copies of all test results to Architect/Engineer for review and approval.

PART 2 PRODUCTS

2.01 BITUMINOUS MATERIALS

A. General:

1. Bituminous Surface Course: Bituminous wearing or surface mix shall be Type SC-1, Class 8 as specified in Sections 401 and 702 of the MDOT Specifications.
2. Bituminous Binder or Leveling Course shall be Type BC-1 as specified in Sections 401 and 702 of the MDOT Specifications.
3. Bituminous Base Course: Bituminous base course shall be Type BB-1, Class 7 as specified in Sections 401 and 702 of the MDOT Specifications.

B. Mineral Aggregate

1. Mineral aggregate for hot-mix asphalt shall consist of coarse aggregate, fine aggregate, and, if needed, mineral filler.
2. Coarse aggregate shall be sound, angular crushed stone, crushed gravel, or crushed slag.

2.02 HERBICIDE

- A. Provide dry, free-flowing, dust-free chemical compound containing not less than 30% sodium chlorate or a chlorate-borate compound, non-flammable, not creating a fire hazard when applied in accordance with manufacturer's recommendations, soluble in water, and capable of being spread dry or in solution.

2.03 PAVEMENT MARKING

- A. Provide traffic paint as indicated on the Drawings and as specified in Section 02778, in colors indicated on the Drawings or as selected by the Architect.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Subgrade

1. All debris, vegetation, or other perishable materials shall be removed from the work site, except for trees and shrubs designated for preservation.
2. The site to be paved shall be graded to the required section and all excess material removed from the locations of the work. Material in soft spots shall be removed to the depth required to provide a firm foundation and shall be replaced with a material equal to or better than the best

subgrade material on site as determined by qualified soils testing laboratory personnel.

- a. Should excavations to remove weak soils become excessive in the opinion of the Architect/Engineer, bridging will be acceptable. Bridging material (covered under Section 2300 – 'Earthwork') shall be placed to a maximum thickness of 18-inches, with the top 8 inches compacted to not less than 95% Standard Proctor dry density.
3. The entire subgrade area shall be thoroughly compacted to meet 95% standard Proctor density or as required by the Architect/Engineer. The surface of the subgrade after compaction shall be hard, uniform, smooth and true to grade and cross-section. Stability is achieved when no significant pumping or yielding of soils under load is observed.
4. Apply the specified weed killer to the entire area to be paved. Adhere to the manufacturer's application recommendations.
5. A prime coat, when required, shall be placed on subgrade in accordance with Section 408 of the MDOT Specifications.

B. Patching

1. Architect/Engineer will examine the pavement surface and designate the areas to be patched. The designated areas shall be trimmed to neat vertical lines for the depth of unstable material as directed.
2. Loose, faulty material shall be removed from the job site. The newly exposed patch area shall be cleaned and treated with prime or tack material as directed prior to placement of asphalt within the patch.
3. Bituminous patch material shall be placed and compacted until the patch area is filled to the elevation of the surrounding surface. Compaction of the patch material shall be to the extent that further consolidation of the patching material is not anticipated and is acceptable to the Architect/Engineer.

C. Leveling/Overlays

1. Existing surface shall be brought to proper grade and cross-section with asphalt material prior to placement of wearing surface.
2. A tack coat, if specified, shall be applied in accordance with Section 407 of the MDOT Specifications at the rate as directed by the Architect/Engineer up to a maximum of 0.10 gallon per square yard for emulsified asphalt and 0.07 gallon per square yard for asphalt cement.

3.02 INSTALLATION

A. Qualification of Workmen

1. Furnish at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of the work described for this section and who shall be present at all times during progress of the work of this section and shall direct all work performed under this section.
2. For actual finishing of bituminous concrete surfaces and operation of the required equipment, use only personnel trained and experienced in the skills required.

B. Placing of Mixture

1. For all areas of more than 1,000 square yards, hot mix asphalt base and surface courses shall be spread and struck off with a paver. Any irregularities in the surface of the pavement shall be corrected directly behind the paver.
2. Excess material forming high spots shall be removed with a shovel or lute. Indented areas shall be filled with hot-mix and smoothed with a lute or edge of a shovel being pulled over the surface.
3. In areas of less than 1,000 square yards, hot-mix asphalt base and surface courses may be spread and finished by hand. Wood or steel forms, rigidly supported to ensure correct grade and cross-section may be used. Hand placements shall be performed to avoid segregation of the mix. Any lumps that do not break down readily shall be removed.
4. Adjust frames and covers, if so required, to meet final grades.
5. In no case shall asphalt be accepted for placement that arrives on the job site having a temperature less than 280°F.
7. Where thickness of finished pavement is less than 3-inches, spread in one layer.

B. Rolling and Compaction

1. Asphalt Base and Surface: Rolling shall start as soon as the hot-mix asphalt can be compacted without displacement. Rolling shall continue until the hot-mix asphalt is thoroughly compacted and all roller marks have disappeared.
2. In areas too small for the roller, a vibrating plate compactor or hand tamper shall be used to achieve through compaction.

3.03 WEATHER LIMITATIONS

- A. Install asphalt on a dry unfrozen surface when the ambient temperature is above 40°F and rising, or above 50°F when falling, and when the weather is not rainy or

foggy.

3.04 SURFACE TOLERANCES

- A. The final surface of the completed work, when tested with a 10-ft (3-m) straightedge, shall not contain irregularities in excess of 1/8-inch.
- B. Significant depressions or "bird baths" that hold water will not be accepted. If a depression is found where water ponds to a depth of more than 1/8" in ten feet (10'), fill or otherwise correct to provide proper drainage.

3.05 PAVEMENT MARKINGS

- A. Prepare the surfaces and apply the specified paint in accordance with the manufacturer's recommendations as approved by the Architect. Refer to Section 02778 for further installation information.

3.07 PROTECTION FROM TRAFFIC

- A. Open streets and parking areas for traffic as soon as possible. Provide barricades with flashing warning lights for trenches left open overnight as minimum protection. Adhere to standard practices of the Manual on Uniform Traffic Control Devices (MUTCD) for signs and traffic control devices used to delineate work zones.

END OF SECTION

SECTION 02742

ASPHALT EDGE STRIP

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for asphalt edge strips where concrete curbs do not occur.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings for installation. Include plans, elevations, and details indicating connections to adjoining work.

1.3 QUALITY ASSURANCE

- A. Coordinate the work of this Section with work specified in Section 02741 Hot-Mix Asphalt Paving.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver store and handle products in accordance with manufacturer's directions.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Permaloc Asphalt Edge Aluminum Asphalt Restraint equal to Permaloc Corporation. Tel: 1-800-356-9660 Web: permaloc.com

2.2 MATERIALS

- A. 6005 alloy aluminum containing silicon and magnesium as the major alloying elements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Install edge restraint in strict accordance with the manufacturer's directions.

3.2 PROTECTION

- A. Protect from damage until substantial completion.

END OF SECTION

SECTION 02751 CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide concrete paving work (for sidewalks, curbs ramps, slabs and flatwork) where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Do not commence placement of concrete until mix designs have been review and approved by the Architects and all governmental agencies having jurisdiction, and until copies of the approved mix designs are at the job site and the batch plant.
- C. Provide access for, and cooperate with, the inspector and testing laboratory described in Division I Sections of these Specifications.
- D. Prior to commencing the work of this Section, the Contractor shall verify the accuracy of layout and grading. Verify that all subgrade and base course aggregate conditions are as specified. Notify the Architect/Engineer of any discrepancies and coordinate the correction of those discrepancies with other trades as necessary.
- E. Protect all finished work. Vandalized work will be rejected.

1.3 REFERENCES

- A. This section references the latest revisions of the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

American Association of State Highway and Transportation Officials (AASHTO)
"Standard Specifications for Highway Materials and Methods of Sampling and Testing"

Mississippi Department of Transportation (MDOT) "Mississippi Standard Specifications for Road and Bridge Construction"

1.4 SUBMITTALS

- A. Furnish samples, manufacturer's product data, test reports, and materials certifications for Portland cement products, expansion joint materials, fillers, sealants, etc.
- B. Provide mock-up of concrete finishes, colors, and joints on a sheet of plywood, minimum 48 inches square. Concrete mock up shall be provided for the Architect/Engineer's review a minimum of 48 hours in advance of concrete delivery.

PART 2 PRODUCTS

2.1 FORMS

- A. Provide wood or metal formwork, including adequate bracing, to the lines and grades shown on the Drawings within a vertical tolerance of 0.05 feet and an alignment tolerance of 1" at any point.
- B. Earth forms will not be permitted for paving.

2.2 REINFORCEMENT

- A. Comply with the following as minimums:
 - 1. Bars: ASTM A615, grade 60, unless otherwise shown on the drawings, using deformed bars for number 3 and larger.
 - 2. Welded wire fabric: ASTM A185.
 - 3. Bending: ACI 318.
 - 4. Fibermesh shall be used in lieu of welded wire fabric. The dosage rate shall be 1.5 pounds per cubic yard.
- B. Fabricate reinforcement to the required shapes and dimensions, with fabrication tolerance complying with the CRSI "Manual of Standard Practices."
- C. Do not use reinforcement having any of the following defects:
 - 1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
 - 2. Bends or kinds not indicated on the Drawing of required for the Work;
 - 3. Bars with cross-section reduced due to excessive rust or other causes.

2.3 CONCRETE

- A. Comply with the following as minimums:
 - 1. Portland cement: ASTM C150, Type I or II, low alkali.
 - 2. Aggregate, general:
 - a. ASTM C30, well-graded and clean;
 - b. Do not use aggregate known to cause excessive shrinkage.
 - c. Gravel or crushed limestone shall be hard, durable particles that are thoroughly clean, free from adherent coatings of injurious character, and reasonably free of soft or disintegrated pieces, frozen lumps, vegetable, or other deleterious matter.
 - 3. Coarse Aggregate: Crushed limestone or washed gravel with maximum size between 1-1/4" and 1-1/2", and with minimum size Number 4 sieve. Acceptable gradation can be found in the Mississippi Standard Specifications for Road and Bridge Construction, 2004 Edition, under Section 703.03.2.4.
 - 4. Fine Aggregate: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen. Acceptable gradation can be found in the Mississippi Standard Specifications for Road and Bridge Construction, 2004 Edition, under Section 703.02.2.2.
 - 5. Water: Clean and potable.
 - 6. Minimum 28-day compressive strength: 4,500 psi.
- B. Use only such additives as are recommended in the mix design and approved by the Architect and governmental agencies having jurisdiction.
- C. A source of sand or coarse aggregate may be rejected if experience proves that concrete made from the source does not have a satisfactory service record.

2.4 EXPANSION JOINT MATERIALS

- A. Joint Filler: Pre-formed non-extruding resilient material; asphalt-impregnated fiberboard conforming to ASTM D1751, 3/4-inch wide by depth required to bring top surface within 1/2 inch of slab surface.
- B. Bond Breaker
 - 1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint

filler or concrete surface as required. The tape shall be the same width as the joint.

2. Except where tape is specifically called for on the drawings, bond breaker for concrete shall be either bond breaker tape or a nonstaining type bond prevention coating.

C. Expansion Joint Dowels

1. Dowels shall be smooth steel conforming to ASTM A675, Grade 70. Dowels must be straight and clean, free of loose flaky rust and loose scale. Dowels may be sheared to length provided deformation from true shape caused by shearing does not exceed 0.04 inch on the diameter of the dowel and extends no more than 0.04 inch from the end. Bars shall be coated with a bond breaker on the expansion end of the dowel. Expansion caps shall be provided on the expansion end. Caps shall allow for 1-1/2 inches of expansion.

D. Bonding Agent

1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881, [Type II] [Type V].
2. Latex bonding agent shall be a non-reemulsifiable acrylic-polymer latex conforming to ASTM C1059, Type II.

2.5 ADA RAMP DETECTABLE WARNING STRIP

- A. The warning strip shall be a vitrified polymer composite tile with epoxy polymer composition with a ultra-violet stabilized coating of aluminum oxide particles. Each tactile warning tile shall be 23-1/2" long x 23-1/2" wide x 2-1/2" thick. Refer to drawings for locations and paver orientation.

1. Manufacturer: Hanover Architectural Products, or equal.
2. Color: Limestone Grey or Charcoal, as approved by the Owner.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINAL PREPARATION OF SUBGRADES

- A. After preparation of subgrade as specified in another Section of these Specifications, thoroughly scarify and sprinkle the entire area to be paved, and then compact to a smooth, hard, and even surface according to Section 02300, 'Earthwork'.

3.3 PLACEMENT OF BASE COURSE (WHERE REQUIRED)

- A. Spread the specified coarse aggregate and compact to the thickness indicated on the drawings. Compact to 95% Standard Proctor Density.
- B. Thickness tolerance: Provided the compacted thickness shown on the drawing within a tolerance of minus 0.0" to plus 0.5".
- C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 0.05' vertically and 1' in alignment at any point.
- D. Correct deviations by removing materials, replacing with new material, and reworking or recompacting as required.
- E. Use only the amount of moisture needed to achieve the specified compaction.

3.4 SETTING FORMS

- A. Base Support: Compact the foundation under the forms true to grade so that, when set, they will be uniformly supported for its entire length at the grade as shown. Correct imperfections or variations in the foundation grade by cutting or filling and compacting.
- B. Form Setting: Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints will not move in any direction.

3.5 REINFORCEMENT

- A. Upon completion of base course and formwork, install reinforcement as shown on the Drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce bond or destroy bond with concrete.
 - 2. Position support, and secure reinforcement against displacement by formwork, construction, and concrete placement operations.
 - 3. Place reinforcement to obtain the required coverage for concrete protection.

3.6 PLACEMENT (GENERAL)

- A. Obtain approval of the Architect/Engineer of equipment and materials before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete.
- C. Prior to placing concrete, uniformly moisten the subgrade to achieve required moisture content if appropriate, avoiding puddles of water.
- D. Convey concrete from mixer to final location by approved methods which will prevent segregation or loss of ingredients. Deposit concrete so that it requires as little handling as possible.
- E. While being placed, spade or vibrate and compact the concrete with suitable tools to prevent the formation of voids or honeycomb pockets. Vibrate concrete well against forms and along joints. Over vibration or manipulation causing segregation will not be permitted. Place concrete continuously between joints without bulkheads.
- F. Install a construction joint whenever the placing of concrete is suspended for more than 30 minutes and at the end of each day's work.
- G. Workmen or construction equipment coated with foreign material shall be prohibited to walk or operate in the concrete during placement and finishing operations.
- F. Expansion joints:
 - 1. Do not permit reinforcement to extend continuously through any expansion joint.
 - 2. Locate expansion joints where indicated, filled to full depth with expansion joint material.
 - 3. In curbs, locate thick joint at the beginning and end of curves, and at 25'-0", centers elsewhere.
 - 4. In curbs and paving, hold down ½" and seal exposed joints with joint sealer.

3.7 PLACING CONCRETE FOR CURB AND GUTTER, SIDEWALKS, AND PADS

- A. Place concrete in the forms in one layer of such thickness that, when compacted and finished, it will conform to the cross section as shown.
- B. Deposit concrete as near to joints as possible without disturbing them but do not dump onto a joint assembly.

- C. After the concrete has been placed in the forms, use a strike-off guided by the side forms to bring the surface to the proper section to be compacted.
- D. Consolidate the concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.
- E. Finish the surface to grade with a wood or metal float.

3.8 PLACING CONCRETE FOR VEHICULAR PAVEMENT

- A. Deposit concrete into the forms as close as possible to its final position.
- B. Place concrete rapidly and continuously between construction joints.
- C. Strike off concrete and thoroughly consolidate by a finishing machine, vibrating screed, or hand-finishing.
- D. Finish the surface to the elevation and crown as shown.
- E. Deposit concrete as near the joints as possible without disturbing them but do not dump onto a joint assembly. Do not place adjacent lanes without approval by the Architect/Engineer.
- F. The Contractor shall have available at all times materials for the protection of unhardened concrete in the event of rain.

3.9 CONCRETE FINISHING - GENERAL

- A. The sequence of operations, unless otherwise directed, shall be as follows:
 - 1. Consolidating, floating, straight-edging, troweling, texturing and edging of joints.
 - 2. Maintain finishing equipment and tools in a clean and approved condition.

3.10 CONCRETE FINISHING – CURB AND GUTTER

- A. Round the edges of the gutter and top of the curb with an edging tool to a radius of $\frac{1}{4}$ inch or as otherwise detailed.
- B. Float the surfaces and finish with a smooth wood or metal float until true to grade and section and uniform in texture.
- C. Finish the surfaces, while still wet, with a bristle type brush with longitudinal strokes.
- D. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the surface, while still wet, in the same manner as the gutter and curb top.

- E. Except at grade changes or curves, finished surfaces shall not vary more than 1/8-inch for gutter and 1/4-inch for top and face of curb, when tested with a 10 foot straightedge.
- F. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.
- G. Correct any depressions which will not drain or permit positive drainage to catch basins.
- H. Visible surfaces and edges of finished curb, gutter, and combination curb and gutter shall be free of blemishes, form marks, and tool marks, and shall be uniform in color, shape, and appearance.

3.11 CONCRETE FINISHING FOR PEDESTRIAN SURFACES

- A. Walks, Slabs, Ramps, and Terraces
 - 1. Finish the surfaces to grade and cross section with a metal float, troweled smooth and finished with a broom moistened with clear water.
 - 2. Brooming shall be transverse to the line of traffic.
 - 3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.
 - 4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface edge of the edger. Execute the brooming so that the corrugation produced will be uniform in appearance and not more than 1/16 inch in depth.
 - 5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 3/16-inch when tested with a 10 foot straightedge.
 - 6. The thickness of the pavement shall not vary more than 1/4 inch.
 - 7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.
- B. Steps: The method of finishing the steps and the sidewalks is similar to above except as herein noted.
 - 1. Remove the riser forms one at a time, starting with the top riser.
 - 2. After removing the riser form, rub the face of the riser with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Use an outside edger to round the corner of

the tread; use an inside edger to finish the corner at the bottom of the riser.

3. Give the risers and side wall a final brush finish. The treads shall have a final finish with a stiff brush to provide a non-slip surface.
4. The texture of the completed steps shall present a neat and uniform appearance and shall not deviate from a straightedge test more than 3/16 inch.

3.12 CONCRETE FINISHING FOR VEHICULAR PAVEMENT

- A. Accomplish longitudinal floating with a longitudinal float not less than 10 feet long and 6 inches wide, properly stiffened to prevent flexing and warping. Operate the float from foot bridges in a sawing motion parallel to the direction in which the pavement is being laid from one side of the pavement to the other and advancing not more than half the length of the float.
- B. After the longitudinal floating is completed, but while the concrete is still plastic, eliminate minor regularities in the pavement surfaces by means of metal floats, 5 feet in length, and straightedges, 10 feet in length. Make the final finish with the straightedges which shall be used to float the entire pavement surface.
- C. Test the surface for trueness with a 10 foot straightedge held in successive positions parallel and at right angles to the direction in which the pavement is being laid and the entire area covered as necessary to detect variations. Advance the straightedge along the pavement in successive stages of not more than one half the length of the straightedge. Correct all irregularities and refinish the surface.
- D. The finished surface of the pavement shall not vary more than 1/4 inch in both longitudinal and transverse directions when tested with a 10 foot straightedge.
- E. The thickness of the pavement shall not vary more than 1/4 inch.
- F. When most of the water glaze or sheen has disappeared and before the concrete becomes non-plastic, give the surface of the pavement a broomed finish with an approved fiber broom not less than 18 inches wide. Pull the broom gently over the surface of the pavement from edge to edge. Brooming shall be transverse to the line of traffic and so executed that the corrugations thus produced will be uniform in character and width, and not more than 1/8 inch in depth. Carefully finish the edge of the pavement along forms and at the joints with an edging tool. The brooming shall eliminate the flat surface left by the surface face of the edger.
- G. The finish surfaces of new and existing abutting pavements shall coincide at their juncture.

3.13 JOINTS - GENERAL

- A. Place joints, where shown, conforming to the details as shown, and perpendicular to the finished grade of the concrete surface.
- B. Joints shall be straight and continuous from edge to edge of the pavement.

3.14 CONTRACTION JOINTS

- A. Cut joints to depth as shown with a grooving tool or jointer of a radius as shown or by sawing with a blade producing the required width and depth.
- B. Construct joints in curbs and gutters by inserting 1/8 inch steel plates conforming to the cross sections of the curb and gutter.
- C. Plates shall remain in place until concrete has set sufficiently to hold its shape and shall then be removed.
- D. Finish edges of all joints with an edging tool having the radius as shown.
- E. Score pedestrian pavement with a standard grooving tool or jointer.

3.15 EXPANSION JOINTS

- A. Use a preformed expansion joint filler material of the thickness as shown to form expansion joints.
- B. Material shall be full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.
- C. Anchor with approved devices to prevent displacing during placing and finishing operations.
- D. Round the edges of joints with an edging tool.
- E. Form expansion joints without dowels about structures and features that project through, into, or against any site work concrete construction, using joint filler of the type, thickness, and width as shown, and installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

3.16 CONSTRUCTION JOINTS

- A. Locate longitudinal and transverse construction joints between slabs of vehicular pavement as shown.
- B. Place transverse construction joints of the type shown, where indicated and whenever the placing of concrete is suspended for more than 30 minutes.
- C. Use a butt-type joint with dowels in curb and gutter if the joint occurs at the location of a planned joint.

- D. Use keyed joints with tie bars if the joint occurs in the middle third of the normal curb and gutter joint interval.
- E. In forming construction joints, carefully form a definite groove at the top, to the depth and width shown, to provide a recess for joint sealing material and to prevent any overhang onto concrete already in place. Install keyed joints and reinforcement as shown.

3.17 FORM REMOVAL

- A. Forms shall remain in place at least 12 hours after the concrete has been placed. Remove forms without injuring the concrete.
- B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

3.18 SEALING JOINTS

- A. At the end of the curing, carefully clean and fill joints with joint sealer as shown.
- B. The concrete at the joint shall be surface dry and the ambient temperature shall be above 50°F at the time of application. The joint sealer shall not spill over the joint onto adjacent surface.
- C. Refill joints where necessary before final acceptance. Do not seal joints of pedestrian pavement.

3.19 CURING OF CONCRETE

- A. Cure concrete by one of the following methods appropriate to the weather conditions and local construction practices, against loss of moisture, and rapid temperature changes for at least seven days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. Provide protection as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, remove and replace the damaged pavement and employ another method of curing as directed by the Architect/Engineer.
- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 6 inches.
- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 4 mils in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material.
Sheets shall overlap each other at least 12 inches. Securely anchor sheeting.

- D. Liquid Membrane Curing: Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 5 m²/L (200 square feet per gallon) for both coats. Do not allow the concrete to dry before the application of the membrane. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint. Immediately re-spray any area covered with curing compound and damaged during the curing period.

3.20 CLEANING

- A. After completion of the curing period, remove the curing material (other than liquid membrane), sweep the concrete clean, and, after removal of all foreign matter from the joints, seal joints as herein specified. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

3.21 PROTECTION

- A. The contractor shall protect the concrete against all damage prior to final acceptance by the Architect/Engineer. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the Architect/Engineer, and at no additional cost to the Owner. Exclude traffic from vehicular pavement until the concrete is at least seven days old, or for a longer period of time if so directed by the Architect/Engineer.

3.22 FINAL CLEAN-UP

- A. Remove all debris, rubbish and excess material from the Project.

END OF SECTION

SECTION 02770 CONCRETE WALKS, CURB AND GUTTERS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Construction of concrete sidewalks
- B. Construction of concrete curbs and gutters.

1.02 RELATED WORK

- A. Section 02300 – Earthwork
- B. Section 02751 – Portland Cement Concrete Paving

PART 2 - PRODUCTS

2.01 CONCRETE

- A. Portland Cement mix required.
- B. Minimum compressive strength: 3,500 psi at 28 days.

2.02 REINFORCING

- A. Curbs and Gutters: Intermediate grade billet steel, Grade 60. (ASTM A-615, Grade 60)
- B. Walks: Reinforcing bars and 6x6 wire mesh.
- C. Refer to Division 3 sections regarding steel reinforcing for more information.

2.03 JOINTS

- A. Control joints (score joint), ½ inch deep
- B. Expansion joints:
 - 1. Preformed Asphaltic Expansion Joints ½ inch wide, asphaltic, pre-molded and manufactured for this type of installation shall conform to the Standard Specifications for Pre-formed Expansion Joint Fillers for Concrete (non-extruding and resilient types), AASHTO M213.
 - 2. Elastomeric Sealant as manufactured by ChemRex, Inc., Sonneborn Building Products, Minneapolis, MN, or approved equal.
 - 3. Slip dowels shall be smooth steel bars, size equal to continuous reinforcement, either greased or with a cover pipe on one end.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install prior to the placement of any adjoining roadway or parking lot paving.
- B. Where new curb and gutters abut existing curb and gutter:
 - 1. Top elevations of the two shall match.
 - 2. Provide expansion joints between new and existing construction.
 - 3. Provide a smooth, straight interface between new and existing construction. Sawcut existing curb if necessary to achieve a smooth, straight joint.
 - 4. Preserve reinforcing steel in existing curb where possible when tying into new curb and gutter.

3.02 LAYOUT

- A. Locate true to line and grade as established on the drawings
- B. Curb and gutter indicated to be within a curve shall have a full, even curved appearance. Tangent sections not allowed.
- C. Grades shall be set so as to not impede the flow of drainage, and to not allow water to stand.

3.03 JOINTS

- A. Expansion joints
 - 1. Curb and gutter: Locate expansion joints with slip dowels at 60 foot intervals on straight runs, and at radius tangent points, unless specified otherwise on the drawings.
 - 2. Walks: locate expansion joints where walks abut buildings, steps, curbs, and other fixed structures, at a maximum of 20' on center along walks.
- B. Control Joints
 - 1. Curb and gutter: Locate control joints (score joints) at 20-foot intervals.
 - 2. Walks: Form control joints in walks as noted, but generally spaced not to exceed the width of each particular walk. Minimum spacing shall be four feet (4').

3.04 FINISHES

A. Curb and Gutter

1. Light broom finish stroked with the direction of the curb and gutter.

B. Walks

1. Exposed faces shall have not burns or form marks. Rub all exposed vertical surfaces. Voids in concrete shall be immediately filled after form is removed.
2. Round edges except those adjacent to brick or modular paving, including those at expansion and dummy joints and to $\frac{1}{4}$ -inch radius.
3. Provide light broom finish, transverse to foot traffic.

END OF SECTION

SECTION 02778

PAVEMENT MARKING AND SIGNAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Application of pavement markings to roadway pavement to the color, dimensions, and locations indicated on the Drawings.
- B. Installation of roadside and curbside signs to the color, dimensions, and locations indicated on the Drawings.

1.02 REFERENCES

- A. Mississippi Department of Transportation (MDOT)
 - 1. Mississippi Standard Specifications for Road and Bridge Construction, latest English edition, (MDOT Specifications) Sections 625, 626 and 627.
- B. Manual on Uniform Traffic Control Devices (MUTCD), Current Edition.

1.03 QUALITY ASSURANCE

- A. Qualifications of manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of satisfactory production acceptable to the Architect/Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper installation.
- C. Contractor shall guarantee that all traffic lane pavement markers be in place and adhered to the pavement for a period of not less than 90 days from the date of acceptance of the work by the Owner.

PART 2 PRODUCTS

2.01 TRAFFIC PAINT

- A. Traffic paint shall conform to or exceed the standards set forth by the Mississippi Department of Transportation.
- B. All paint shall be thoroughly mixed prior to placing in painting equipment.

2.02 SIGN PANELS

- A. Sheeting material for sign panels, delineators, barricades and other markers shall be aluminum sheets or plates conforming to ASTM B 209, Alloy 6061-T6 or Allow 5052-H38.

2.03 REFLECTIVE SHEETING

- A. Reflective sheeting shall be at least Type I, which is a medium-intensity retroreflective sheeting referred to as engineering grade, and typically enclosed lens glass-bead sheeting conforming to ASTM D 4956.

2.04 STEEL POSTS

- A. Steel pipe or tubing for structures shall be Schedule 40 conforming to ASTM A 53, Type E or Type S Grade B, or hot formed tubing conforming to ASTM A 36 and ASTM A 501.

PART 3 EXECUTION

3.01 TRAFFIC PAINT AND GLASS BEADS

- A. All new surfaces shall have the traffic paint applied in two applications. The first or priming coat shall be in light applications without glass beads to seal the pavement. The second heavier coat of paint is the wearing surface and shall be applied at a rate of 1 gallon per 264 linear feet of four inch stripe.
- B. Restriping where indicated on the drawings shall coincide with the original painting and shall be applied in one application at the rates indicated in Table 1.
- C. All surfaces to be painted shall be clean and dry prior to painting. Ample time shall be allowed between the asphalt pavement seal coat and the initial painting application. Usually the drying time of the seal coat is approximately three (3) to four (4) days, depending upon weather conditions. There shall be a minimum drying time between paint applications of approximately 20 minutes.
- D. Glass beads shall be placed on all traffic stripes and pavement markings except for the first or priming coat on new asphalt surfaces. Rate of application shall be not less than six (6) pounds of beads per 264 linear feet of four inch stripe, coinciding with the paint application. All glass beads shall be applied directly to the wet traffic paint with a method that provides uniform distribution.
- E. The Contractor shall provide sufficient evidence to the Owner's representative that the quantity of paint specified has been applied to the job. Such evidence can be invoice tickets made out to the specific job, inventory of empty paint cans, or other method acceptable to the Architect/Engineer.

- F. Striping shall not be applied at temperatures below 40°F or if pavement surfaces are wet.
- G. The alignment of all striping shall be accurately laid out. Lines which do not conform to the alignment as set forth in the Plans, or which have a wavy appearance, shall be removed and replaced by the Contractor at his expense.

3.02 REMOVAL OF STRIPES

- A. All stripes and pavement markings not in conformance with the proposed striping plan or showing deficiencies or irregularities as deemed by the Architect/Engineer shall be removed by grinding or sandblasting.
- B. Use of black paint will not be allowed unless specifically indicated on the drawings. In slurry seal and asphalt concrete overlay areas, painting stripes and markings need not be removed prior to sealing or overlay operations; all thermoplastic material and raised pavement markers shall be removed prior to slurry seal or overlay operation

3.03 PROTECTION

- A. Newly applied pavement markings shall be protected so that paint or thermoplastic material will not be picked up or smeared by the tires of passing vehicles. Warning signs and barricades shall be placed as practical and as far in advance as possible to reduce the possibility of damage by passing motorists. Any paint or material so damaged, marred or picked up by vehicle traffic shall be repaired, and thermoplastic material tracked onto the pavement shall be removed, all at no additional cost to Owner.

3.04 SIGN INSTALLATION

- A. Roadside Signs
 - 1. Roadside signs shall be constructed with sign faces vertical.
 - 2. Signs shall be constructed to a minimum height of 6 feet above the edge of pavement to the bottom of signs.
 - 3. Minimum horizontal clearance from edge of roadway to any ground sign shall be as shown on the plans or as directed.

END OF SECTION

SECTION 02820

CHAIN LINK FENCING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for the erection of 8 foot tall chain link fencing on steel posts as indicated on the Drawings.

1.2 QUALITY ASSURANCE

- A. Obtain all components of chain link fencing from one manufacturer specializing in the manufacture of chain link fencing products.
- B. Installer/subcontractor shall have a minimum of five years experience in the installation of fencing systems similar in size and scope to the work of this project.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Equal to products of Ameristar Fence Products, 1555 N. Mingo Road, Tulsa, OK 74116. Tel: 800-321-8724 Web: ameristarfence.com
 - 1. Fence system shall be Permacoat PC-20

2.2 CHAIN LINK FENCE FABRIC

- A. Fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 2A - Extruded and Bonded.
 - 1. Selvage: Top and bottom edge shall be knuckled or twisted.
 - 2. Color: The coating color for the fence fabric shall be Black.
 - 3. Wire Size: The size of the steel wire core prior to coating shall be 9 gauge.
 - 4. Height and Mesh Size: The fabric height shall be eight (8) feet high with a mesh size of 2 inches.

2.3 TENSION WIRE

- A. Shall be steel not less than No. 7 gauge, zinc coated with a minimum of 0.80 ounce of zinc per square foot of surface area.

2.4 FRAMEWORK

- A. Post and other framing materials shall be galvanized steel pipe, Schedule 40. Color shall be black PermaCoat.
 - 1. End, corner and pull posts shall be 2.875 inches minimum O.D. prior to coating.
 - 2. Intermediate posts shall be 2.375 inches minimum O.D. prior to coating.

2.5 FENCE FITTINGS

- A. Fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same PermaCoat color coating system required for the framework.

2.6 CONCRETE FOR POST SETTING

- A. Refer to Section 03300 - Cast in Place Concrete

PART 3 EXECUTION

3.1 CLEARING

- A. The site of the fence shall be cleared of obstructions and surface irregularities and graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of two (2) feet on each side of the centerline of the fence.

3.2 POST SPACING

- A. Line posts shall be spaced at intervals not to exceed eight (8) feet average when measured from center between terminal posts. Measurements shall be made parallel to the slope of the ground, and posts shall be placed in a vertical position.

3.3 POST SETTING

- A. End, corner, pull, and brace posts shall be set 36 inches deep in concrete bases 12 inches in diameter. All line posts shall be set 18 inches deep in concrete bases 8 inches in diameter. The top of concrete bases shall be slightly above ground and sloped to drain. Gate posts shall be set with their tops level with one another.
- B. Concrete bases shall be allowed to cure at least seven (7) days before installing fence fabric.

3.4 HORIZONTAL BRACING AND TRUSS RODS

- A. Provide at each terminal and corner post. Braces shall be clamped to posts at each end.

3.5 CHAIN LINK FABRIC

- A. The fabric shall be placed on the outside of the posts, stretched taut approximately 2 inches above the ground, and fastened securely to the post. Fastening to terminal posts shall be by means of stretcher bars, with fabric bands spaced at a maximum of 15 inches on centers.
- B. Fabrics shall be fastened to line posts by means of metal bands, or other approved method, spaced at maximum of 15 inches on centers. The top edge of the fabric shall be fastened to the top rail by means of wire ties spaced at a maximum of 18 inches on centers. The bottom edge of the fabric shall be fastened to the bottom tension wire by means of wire ties spaced at a maximum of two (2) feet on centers. Ends of abutting rolls of fabric shall be joined by weaving a single strand of wire into the ends to form a continuous mesh.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for 8'-0" tall decorative welded wire fences, gates, gate operators, gate hardware, and accessories.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions on all products specified.
- B. Submit shop drawings for the fabrication, installation, and layout of fencing system including gates, gate operators, keypads, gate hardware, and controls. Include plans, elevations, sections, and details of fence and gate components and connections to adjoining work. Indicate materials, finishes, fasteners, hardware, post anchoring, joinery and other information to determine compliance with specified requirements.
- C. Submit samples of fence components in color as selected.
- D. Submit Installer qualifications including list of completed projects, training, and references.

1.3 QUALITY ASSURANCE

- A. Fence manufacturer shall have a minimum of (10) ten years experience in the manufacture of fencing similar in size and scope of the work of this project.
- B. Fence installer/fabricator shall have a minimum of five years experience in the fabrication and installation of fencing systems, gates, gate operators, keypads, gate hardware, and accessories similar in function, size, and scope to the work of this Project.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Each package shall bear the name of the manufacturer. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

1.5 COORDINATION

- A. The fencing contractor shall coordinate the installation of gate hardware, electrical components required for gate operators, and provide electrical data and access to gate equipment.

1.6 WARRANTY

- A. The entire fence system shall have a written (8) eight year warranty against rust and defects in workmanship and materials. In addition, the finish shall be warranted not to crack, chip, peel, or blister for the same period.

PART 2 PRODUCTS

2.1 FENCE MANUFACTURER

- A. Ameristar Fence Products, Inc., 1555 N. Mingo Road, Tulsa, Oklahoma.
Web: ameristarfence.com Tel: 800-321-8724
 - 1. Equal products by other manufacturers are acceptable upon compliance with the requirements of the Section.

2.2 FENCE STYLE

- A. Ameristar WireWorks Plus.

2.3 MATERIALS

- A. Steel material for fence posts shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 45,000 psi. The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.60 oz/ft², Coating Designation G-60. Fence posts shall be 4 inch minimum.
- B. Steel wire mesh fence panels shall be welded by resistance welding per ASTM A185 using 6 gauge (0.192 inch) pre-galvanized steel wire, welded at each crossing to form rectangles. Vertical 6ga. (0.192) wires shall be spaced at 2 inches; horizontal 6ga. (0.192) wires shall be spaced at 6 inches. The cold rolled wire shall have a tensile strength of at least 70,000 PSI and 74,000 PSI weld shear strength. Wire strand shall be galvanized before welded (GBW), .050 ounces per square foot zinc coating conforming to the ASTM A641.

2.4 FABRICATION

- A. Panels and posts shall be precut to specified lengths. Panels shall have a number of structural folds based on the specified panel height as follows:
 - 1. 96 inches panel height x 96 inches panel width - 4 horizontal panel folds
- B. The manufactured panels and posts shall be subjected to an inline electro-deposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils. The color shall be Black.
- C. Swing gate shall be fabricated as indicated on the drawings from 2 inch square 10 gage structural steel tube. Materials and fabrication shall be in accordance

with Section 05500 - Miscellaneous Metals. Infill with wire fence material.

- D. Vehicle gate shall be fabricated as indicted on the drawings from 2 inch x 4 inch x 1/4 inch steel tubes. Materials and fabrication shall be in accordance with Section 05500 - Miscellaneous Metals. Infill with wire fence material.

2.5 GATES

- A. Pedestrian Gate shall be fabricated as indicated on drawings from steel tube sections. A fence panel shall be cut to size and secured to two uprights using stainless steel screws. Provide diagonal reinforcing if required. Gate shall support a 300 pound vertical load on the latch side of the gate without failure. Gates shall not fail under anticipated dynamic loading typical for gates of this type.
- B. Pedestrian Gate Hardware:
 - 1. Lockset shall be equal to Lockey, 4245 S. Lincoln Road, Mt. Pleasant, MI Web: lockeyusa.com Tel: 989-773-2363
 - a. Lockset: 2835 DC Mechanical Keyless Lever Lock with back finish
 - b. Gate box: GB2500 steel or as required for lockset provided.
 - 2. Hinges shall be equal to Waterson Corp. Web: watersonusa.com Tel: 508-641-3242
 - a. Hinge Model: K51P-400 self closing hinges with black - BMHA 693 powder coat. Provide a minimum of 4 hinges.
 - 3. Provide strike plates, fasteners, and other hardware as required for a complete and functioning installation as indicated on the drawings.
- C. Vehicle gate frames shall be fabricated from structural steel tubes as indicated on drawings.
 - 1. Vehicle Gate shall be fabricated as indicated on drawings from steel tube sections. Fence panels shall be cut to size and secured to two uprights using stainless steel screws. Provide diagonal reinforcing if required.
 - a. Rolling mechanism: Steel wheels with V-shaped edge groove and 6 inches diameter, mounted to gate frame and riding on ground set V-track. Assembly braced at top by adjustable guide wheels mounted with brackets to support posts.

2.6 VEHICLE GATE OPERATOR

- A. Gate operators shall be manufactured by LiftMaster Elite Access Systems or approved equal.

1. Slide gate operator shall be model CSW-200-UL-1HP Series.
- B. Gate operation shall conform to UL 325-Class 2.
- C. Gate keypad entry device shall be mounted on bollards as indicated on site plans and electrical drawings or as directed by Architect.
 1. Wireless Commercial Keypad: KPW250
- D. Gate operation shall be by keypad entry. Provide automobile drive-over loop detector at approximate locations noted on plans. Exact location to be determined in field by gate installer and layout approved by architect.

2.7 FIRE FIGHTER ACCESS

- A. Provide lock box for firefighter access gate control equal to LBLA16 lockbox with red decal, 16 gauge, 5 inches x 5 inches x 1 1/2 inches as manufactured by J.L. Industries. Coordinate location and access control with local fire officials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive fencing and report any conditions detrimental to the proper installation of the fence. Do not proceed with work until detrimental conditions are corrected.

3.2 INSTALLATION

- A. Install fencing and all related products in strict accordance with manufacturer's instructions, approved shop drawings, and as indicated on drawings.
 1. Center and align posts in holes to required depth but no less than 42 inches deep by 18 inches in diameter. Place concrete around posts and tamp for consolidation. After tamping, check alignment of posts, and make necessary corrections before the concrete hardens.
 2. Attach panels in accordance with manufacturer's directions and as indicated on drawings.
- B. Install gate, operators and all related products in strict accordance with manufacturer's instructions, approved shop drawings and as indicated on drawings.
 1. Set gate posts plumb and level for gate openings specified in construction drawings.
 2. Install gates to allow full opening without interference after concrete has hardened around gate posts. Adjust hardware for smooth operation.
- C. Install post caps and other accessories to complete fence.

3.3 CUTTING FENCE PANELS

- A. Where fence panels must be cut to conform to configuration and post spacing indicated treat cuts with paint approved by fence panel manufacturer.

3.4 CLEANING AND PROTECTING

- A. Clean fence and related accessories of foreign matter in accordance with manufacturer instructions and protect from damage.

END OF SECTION

SECTION 02900

LANDSCAPE WORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for plants and other materials to perform all operations in connection with the planting of trees and other such materials in compliance with these specifications and the applicable drawings.
- B. It shall be the responsibility of the Landscape Contractor to visit the job site and become familiar with the nature and location of the work and the conditions that will exist under which he will be obligated to perform the work.

1.2 STANDARDS

- A. The following standards, where applicable, are to be considered a part of these specifications:
 - 1. American Joint Committee on Horticulture Nomenclature, "Standardized Plant Names," Latest Edition.
 - 2. American Association of Nurserymen, Inc., "American Standard for Nursery Stock," Latest Edition.
 - 3. Mississippi Department of Agriculture and Commerce, "Mississippi Fertilizer Law," Rules and Regulations.
 - 4. Mississippi Department of Agriculture and Commerce, "Mississippi Pure Seed Law," Rules and Regulations.
 - 5. All other governing Federal, State and Local Laws, regulations and ordinances applicable to this project and the work described within these contract drawings.

1.3 QUALITY ASSURANCE

- A. Plants will be subject to inspection and approval at the place of growth, or upon delivery to the site, as determined by the Architect, for quality, size, and variety. Such approval will not impair the right of inspection and rejection at the site during progress of the work or after completion, for size and condition of balls or roots, latent defects, or injuries. Rejected plants will be removed immediately from the site.
- B. Plant materials shall comply with State and Federal Laws relating to inspection for diseases and insect infestation.

1.4 SUBMITTALS

- A. Submit certificate of inspection of plant material as required by State and Federal authorities, and manufacturer's or vendors certified analysis for soil amendments and fertilizers.

- B. Submit type written planting schedule and instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration date of required maintenance period.

1.5 PRODUCT DELIVERY

- A. Notify Architect of delivery schedule in advance so that plant material may be inspected upon arrival at job site.
- B. During shipping to job site, all plant material shall be packed to provide adequate protection against climatic, seasonal, and breakage injury during transit. Tops shall be securely protected as necessary to minimize wind-whipping and drying.
- C. Do not deliver more plant materials than can be planted in one day.
- D. Deliver all packaged material to site in original, unopened containers bearing the manufacturers guaranteed chemical analysis, name or trade name, trademark and conformance to State law.
- E. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

1.6 PRODUCT STORAGE

- A. Plants that cannot be planted immediately upon delivery shall be kept in shade and protected at all times from sun, drying winds, freezing and inclement weather, or damage as a result of construction operations and shall be kept well watered. Owner will not be responsible for plant care during installation.

1.7 PRODUCT HANDLING

- A. Handle all plants so that roots are adequately protected at all times.
- B. No plants shall be bound with rope or wire at any time so as to damage the bark, break branches, or destroy its natural shape.
- C. Do not pick up container or balled plants by stems or trunks. Plants handled by stems or trunks shall be considered damaged and removed from site.
- D. Do not drop plants.
- E. Handle packaged material with care so as not to accidentally open containers or contaminate before time of actual use.

1.8 JOB CONDITIONS

- A. Conduct planting operations under favorable weather conditions during the seasons which are normal for such work as determined by locally accepted practice, unless directed otherwise by the Architect.

- B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.9 GUARANTEE

- A. Guarantee new or existing moved plant material for a period of ninety (90) days from date of final acceptance.
- B. Plant Replacement: Any plant not found in a healthy growing condition at the end of the guaranteed period shall be removed from the site and replaced as soon as weather conditions permit.
- C. All replacements shall be plants of the same kind and size as specified in the plant list. They will be furnished, planted and mulched as specified under "Planting," at no additional cost to the Owner.
- D. Final inspection at the end of the guarantee period will be on planting, construction and all other incidental work pertaining to this contract. Any replacement at this time shall be subject to the same ninety (90) days guarantee beginning with the time of replacement and ending with the same inspection and acceptance as herein described.
- E. Dormant season planting shall be guaranteed ninety (90) days or until onset of new growth.

1.10 SCHEDULING

- A. Coordinate work with other trades and professions on the job site. Do not begin work if there is danger of conflict or damage to work by other trades and professions in the normal pursuit of their work.
- B. Plant material shall be placed where and as indicated on plan. Notify Architect of any conditions on site at time of planting that are not shown on plans and which make placing adjustments necessary. The Architect shall furnish to the Contractor written or orally communicated corrected positions.
- C. Planting Schedule: Prepare a proposed planting schedule. Schedule dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- D. Coordination with Lawns: Plant trees after final grades are established and prior to planting of lawns, unless otherwise acceptable to Architect. If planting of trees occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

PART 2 PRODUCTS

2.1 PLANT MATERIALS

- A. All plants shall be well-formed and shaped, true to type, and conform to the measurements specified in the plant list. Plants that meet the requirements specified in the plant list, but which do not possess a normal balance between height and spread will not be accepted. All plants shall be freshly dug (where applicable), healthy, vigorous, well-branched and free of disease and insect egg and larvae, and will have adequate root systems.
- B. Plant names and labels shall conform to the current edition of Standardized Plant Names as adopted by the American Joint Committee on Horticultural Nomenclature. All plants shall be true to name, quantity, and size as indicated in plant list.
- C. Plants shall not be pruned prior to delivery.
- D. Plants shall be nursery grown, unless otherwise specified, and shall have been growing under similar climatic conditions to those in locality of project. Plants larger than those specified may be used if approved by Architect, but use of such plants shall not increase the contract price. Root spread or root balls shall be increased in proportion to the size of the plant.
- E. Substitutions will be permitted only if proof is submitted that specified plants or sizes are unobtainable. Proposals will be considered for nearest equivalent size or variety with equitable adjustment of contract price. Substitutions shall be acceptable only upon written notice.
- F. Plants shall be tagged with durable, legible labels stating in weather resistant ink the plant name and size as specified in the plant list. Labels shall be securely attached to all plants, bundles, or packages of plants of a single species and size. Labels shall be removed from plants immediately after final acceptance. Notify Architect of removal for project closeout.
- G. Digging and Handling: All plant stock shall be dug and handled with reasonable care and skill to prevent injuries to the trunk, branches, and roots, and shall be packed in an approved manner to insure arrival at the project site in good condition.
- H. Balled and Burlapped Plants: Dig plants with firm, natural balls of soil and of sufficient size to encompass the fibrous and feeding roots of the plant. No balled plant shall be planted if the ball is cracked or broken unless approved by Architect. Wrap ball securely with burlap or strong biodegradable cloth and bind tightly with rope or wire.
 - 1. Container grown plants will be accepted as balled and burlapped provided the plants have been growing in containers for at least one full growing season prior to delivery to the job site, and that containers are adequate for the developing root system of the plant.

2. In hot weather, maintain stock in shade house for a minimum of one week to allow plants to recover from digging shock.
- I. Collected Stock: Collected plants shall have been grown in favorable locations on subgrades which insures good fibrous roots and vigorous conditions, and good soil conditions. Minimum size of earth ball shall equal to that required for the next larger size nursery grown stock.
- J. Specimen Plants: Specimen plants shall be selected for shape and branching habit which at maturity will produce a strong, full foliated example of its species.
- K. Container Grown Stock: All container grown material shall be healthy, vigorous, well-rooted and established in the container in which they are sold. Tops shall be of good quality and in a healthy growing condition. Containers shall be sufficiently rigid to hold the ball shape protecting the root mass during transit.
 1. Plants shall be established in their containers sufficiently long enough for the fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container.
 2. Plants shall have small stakes in containers where required to support the plants. Container plants that are root-bound will not be accepted.
- L. Plants shall have been grown in containers long enough to insure sufficient root growth to hold soil in place and retain the original shape when removed from the container. Plants shall have healthy tops to a size proportionate to the root requirements typical to a species or variety.

2.2 TOPSOIL

- A. Topsoil, shall be a natural, fertile, friable soil of loamy character capable of sustaining vigorous plant growth. It shall be free of stones, lumps, plants, roots, obnoxious grass and weeds, and other foreign matter. It shall be of uniform composition throughout, not excessively acid or alkaline, nor contain substances which may be harmful to plant growth. Existing on site soil may be utilized in planting soil mix if existing soil is of good quality to promote healthy plant growth and is approved by Architect.

2.3 PEAT

- A. Peat moss shall be a sphagnum brand consisting of partially decomposed organic matter of natural occurrence. It shall be brown in color, clean, low in content of mineral and woody material, with a ph range of 4 to 6.5. Natural moisture content shall be not more than 30 percent with a water absorbing capacity of 1100-2000 percent. It may be either granulated or shredded. Minimum organic matter by weight on an oven-dried basis shall be 85 percent.

2.4 PLANTING SOIL

- A. All plant beds and plant pits shall have the following soil mixtures: three (3) parts approved topsoil, one (1) part sharp masonry sand, and one (1) part peat

all well-mixed into a good friable material. All planting areas shall receive an application of approved pre-emergent herbicide incorporated thoroughly into planting beds prior to installation of plant material. Apply herbicide at manufacturer's recommended rates and procedures. Notify Architect prior to application of pre-emergent.

2.5 FERTILIZER

- A. Commercial fertilizer will be a complete fertilizer, uniform in composition, dry and free flowing. Deliver fertilizer to site in original, unopened containers. each bearing the manufacturer's statement of analysis (see drawings for specified mixture if required).
- B. Fertilizer shall not be applied to planting beds or pits unless otherwise specified by the Architect. Instead, apply Fertilome Root Stimulator or approved equal to beds and pits in compliance with manufacturer's recommended rates and procedures.

2.6 MULCH

- A. Unless otherwise specified, mulching material shall be clean pine straw, free of foreign matter, and balled for the purpose of mulching. Pine straw shall be lightly compacted and applied as indicated on drawings. If required, shredded pine bark nuggets may be used for mulching. Apply as indicated on drawings.

2.7 TREES

- A. Trees shall be Lagerstroemia Indica, Natchez Crape Myrtle.
 - 1. Minimum height: 6 - 8 feet
 - 2. Caliper: Minimum of 3 feet clear main trunk with a 3 to 5 branch trunks.
- B. Tree height shall precede caliper but minimum caliper shall be in accordance with ANN standards.
- C. Tree wrapping shall be double thick crepe paper cemented together with bituminous material. Wrapping shall be a minimum of 4 inches wide and secured with a lightly tarred medium or coarse sisal yarn.

2.8 GUYING AND STAKING MATERIAL

- A. All wood required for staking and guying shall be number 2 construction grade treated pine. See drawings for planting details and plant list for required methods of application.
- B. All guy wire shall be single strand 12 gauge galvanized wire of a type equal to reinforcement steel tie wire in solid lengths to complete this operation.
- C. Hose shall be new or used reinforced rubber garden hose.

- D. Malleable iron fence posts shall be used for staking when required by Architect.

2.9 WATER

- A. All water necessary for planting and maintenance shall be satisfactory quality to sustain the growth of plants and shall not contain harmful, natural, or man-made elements detrimental to plants. Potable water meeting the above standard shall be obtained on the site from the Owner, if available, and the Contractor shall be responsible to make arrangements for its use by his tanks, hoses, sprinklers, etc. If such water is not available at the site, the Contractor shall provide such satisfactory water from sources off the site. The Contractor shall be responsible for watering plants until sprinkler system is operable.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify establishment of final grades prior to beginning planting operations. Inspect plants for injury and insect infestation. Do not begin planting or wrapping of trees until deficiencies are corrected or plants replaced.
- B. Inspect soil conditions to determine if soil is free of rubbish or objectionable matter harmful to plant growth. If any adverse conditions are found notify the Architect.

3.2 PREPARATION

- A. Stake out locations for plants and outline of planting beds on ground. Do not begin excavation until staking locations and plant beds are approved by Architect.
- B. Slight changes may be made in plant location which conflict with utility lines. Such relocation is subject to the approval of the Architect.
- C. Topsoil, peat and sand may either be pre-mixed or mixed in place by spreading all materials evenly over entire area to be prepared and roto-tilling thoroughly until a homogenous mixture is achieved to full depth of bed as required.
- D. Reasonable care should be exercised to have pits and beds dug and soil prepared prior to moving plants to their respective locations for planting to ensure that they will not be unnecessarily exposed to drying elements or physical damage.

3.3 EXCAVATION FOR PLANTING

- A. Plant pits shall be circular in outline with vertical sides and flat bottoms. Prepare all pits six inches deeper in depth than ball or container size to be received. Shrub pits shall be a minimum of sixteen inches in depth, and tree pits shall be a minimum of 20 inches in depth. Shrub pits shall be a minimum of 1.5 times greater in diameter than plant ball. Tree pits shall be a minimum of twelve inches greater in diameter than ball for trees up to three inch caliper, and a

minimum of eighteen inches greater for trees over three inch caliper. Groundcover beds shall be prepared uniformly to a depth of nine inches. Shrub beds utilizing mass planting shall be uniformly excavated to the required depth. No such beds shall be prepared by digging pits for each shrub.

3.4 PLANTING

- A. Center plant in pit or place as required in bed and face for best effect. Place sufficient planting soil under plant as required to raise plant 1 to 2 inches above existing grade so that after settlement it bears same relation to finish grade as it bore to the grade of the soil from which it was dug. Set plant plumb and hold rigidly in position until soil has been tamped firmly around root ball. Plant pit or bed shall be backfilled with planting soil in layers, each carefully tamped in place to avoid injury to roots or disturbing position of plant. When backfilled approximately two-thirds of depth, fill pit or bed with water to settle soil around roots. After soil settles, fill remainder of pit or bed with planting soil, water and tamped lightly to grade. Rake smooth to drain.
- B. Balled plants shall be placed in pit on planting soil material that has been hand-tamped prior to placing plant. Set plumb and straight 1 to 2 inches above existing grade as above. Cut burlap or cloth, ropes, wire, or other wrapping materials and remove from top 1/3 of ball. Do not pull wrappings from under ball. Do not plant if ball is cracked or broken before or during planting process.
- C. For container grown plants, cut cans on two sides with an acceptable can cutter, taking care not to damage root ball. Do not cut sides on knockout cans. Carefully remove plants so as not to damage root ball. After removing plant, scarify edge roots on three sides. For containers less than one gallon in size, place plants, backfill and tamp by hand, leaving slight depression around base of plants. Cover root ball with a maximum of 1/4 inch of planting soil.
- D. Build 4 inch saucer continuous around all trees which stand alone and are not in larger mulched beds. Construct saucer of planting soil and tamp firmly in place to retain shape.

3.5 MULCHING

- A. Mulch all planting pits and beds immediately after planting, covering the entire area around each plant to the depth required. Water thoroughly immediately after mulching.

3.6 GUYING AND STAKING

- A. Trees shall be supported immediately after planting. Trees up to 4 inch caliper shall be staked, and those over 4 inch caliper shall be guyed. Trees over 4 inch caliper may be staked in special situations where guying is impractical. Smaller trees shall be staked according to planting details, unless otherwise specified. Trees shall stand plumb with braces taut for a period of one year.
- B. Guying shall be done in compliance with planting details as illustrated in drawings. Wire shall be encased in hose around lower-most branches of tree in

a single loop to prevent direct contact with bark of tree. Wires shall be tightened and kept taut by twisting the strands together.

- C. Staking shall be done in compliance with planting details as illustrated in drawings. Drive stakes a minimum of 2 feet perpendicularly into ground at edge of root ball. Where required nail cross members to stakes with six penny galvanized nails.

3.7 PRUNING

- A. Each tree (and shrub, if required) shall be pruned in accordance with standard horticultural practice to preserve natural character of plant. Pruning shall be done with clean, sterile sharp tools.
- B. Prune new plant material as required to remove injured twigs and branches, deadwood and suckers. For newly planted trees, remove 1/3 to 1/4 of branching structure to compensate for root loss. Make all cuts flush with trunk or adjacent branch.
- C. Cuts over 3/4 inch diameter shall be painted with an approved tree paint. Paint shall be waterproof, adhesive and elastic, and intended for the prescribed use.

3.8 WRAPPING

- A. Trees shall be wrapped immediately after planting winding from the grounding line to above the lowest main branches. Overlap wrapping approximately 2 inches and tie securely in place. Maintain in place one year.

3.9 MAINTENANCE

- A. All plants and planting included in this contract will be maintained by watering, cultivating and spraying, tightening guys and other operations necessary to insure a healthy condition until Architect makes final acceptance and submits certificate for payment. Maintenance from this day forward shall be the responsibility of the Owner.

3.10 CLEAN UP

- A. As planting operations proceed, all rope, wire, burlap, empty containers, rocks, clods, and all other debris pertinent to this work shall not be allowed to accumulate but shall be removed daily and the site kept as neat as possible at all times.

3.11 FINAL INSPECTION AND ACCEPTANCE

- A. Request for final inspection and acceptance shall be made at least 48 hours prior to anticipated completion date. All items of work shall be complete upon inspection including project clean-up.
- B. Replace rejected material with acceptable material as soon as possible within acceptable planting dates.

END OF SECTION

SECTION 02927

SODDING LAWNS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes the installation of sod and related products at all exterior ground areas within the limits of the contract, except surfaces occupied by buildings, structures and pavement, and areas indicated as undisturbed or otherwise planted as shown on drawings. The work shall include furnishing and/or spreading topsoil, finish grading, preparing sod bed, compacting sod bed, covering sod and providing plant establishment in compliance with the contract drawings and specifications.

1.2 SITE CONDITIONS

- A. Permanent sodding shall be conducted only between April 1st to September 1st. If the completion schedule of the work falls between September 1st and April 1st temporary winter seeding will be required followed by permanent sodding executed as soon as possible thereafter within the allowable planting schedule.
- B. Sodding operations shall not begin until all construction procedures have been completed, unless otherwise approved.

1.3 SUBMITTALS

- A. Submit qualifications of sodding installer including references.
- B. Submit product data and technical information, installation instructions and general recommendations for each product specified.

PART 2 PRODUCTS

2.1 FERTILIZER

- A. Commercial fertilizer shall be 13-13-13 formula 13 percent nitrogen, 13 percent phosphoric acid, 13 percent potash. Fertilizer shall be dry, granular and bagged in manufacturer's original unopened container.

2.2 AGRICULTURAL LIME

- A. Ground or pulverized, containing not less than 90 percent calcium carbonate and shall be ground to such a fineness that 50 percent will pass through a 1000 mesh sieve and 90 percent will pass through a 20 mesh sieve.

2.3 MULCHING

- A. Threshed straw of cereal grain (wheat, rice, oats). All material shall be free of

Johnson grass, broom sedge, weed seed and noxious materials. Hydro seeding mulch shall be equal to Conwed binder and mulch material.

2.4 TOPSOIL

- A. Natural, fertile, friable soil possessing characteristics of representative productive soils in the vicinity. It shall be free of stones, lumps, plants, roots, obnoxious grass and weeds and other foreign matter. It shall be of uniform composition throughout, not excessively acid or alkaline, nor contain substances which may be harmful to plant growth. Existing on-site soil may be utilized in planting soil mix if of good quality to promote healthy growth approved by Architect. Topsoil shall not be stripped, collected or deposited while wet.

2.5 SOD

- A. Provide strongly rated sod, not less than 2 years old and free of weeds and undesirable nature grasses. Provide only sod capable of growth and development when planted (viable not dormant). Provide sod composed only of St. Augustine, Eremochloa ophiuroides.

PART 3 EXECUTION

3.1 GROUND PREPARATION

- A. Thoroughly loosen the surface of all areas to be sodded to a depth of 4 inches by plowing, discing and harrowing, or by other approved methods. All clods and lumps shall be pulverized to provide a smooth, uniformly loose, well-broken surface, free of roots and other objectionable foreign matter.
- B. Topsoil shall be placed evenly to a minimum average depth of 3 inches, with the minimum depth at any one area being 2 inches.
- C. At least seven (7) days prior to sodding, lime shall be applied at a rate of 50 pounds per 1000 square feet and thoroughly incorporated into soil to a depth of 3 inches.
- D. Grade lawn areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth, uniform grade. Slope all lawn areas to drain. Roll, scarify, rake and level as necessary to obtain true even lawn surfaces.
- E. Hand dressing will be used in all areas within 20 feet of any building construction to obtain a perfectly smooth and properly graded area to provide drainage away from the structure and paved areas with elevations as shown on drawings. All other areas shall be machine graded unless otherwise noted. Allow for sod thickness in all areas.

3.2 FERTILIZING

- A. Apply fertilizer at the rate of 20 pounds per 1000 square feet. Incorporate into soil to a depth of 3 inches by discing, harrowing or other means.

- B. Mulch shall be placed uniformly in a continuous blanket at a rate of 1 bale per 1000 square feet. Mulching shall take place within 24 hours after completion of seeding operations and shall begin on the windward side of areas and from tops of slopes. The use of wet vegetative materials will not be permitted and baled material shall be loose and thoroughly broken before it is distributed.

3.3 SODDING

- A. Install sod at all swales and areas where the finish grade slope is greater than 1:3 and at other locations shown on the drawings. Sod shall be installed on firm topsoil as herein specified without any gaps between pieces. Roll sod to assure stable contact with the topsoil and to avoid any air pockets. Install only sound, full pieces of sod in pieces as large as practicable.

3.4 ESTABLISHMENT AND MAINTENANCE

- A. Lawn areas shall be protected and maintained by watering, mowing and resodding as may be necessary for at least 60 days after completion of the last lawn operation and as much longer as is necessary to produce a uniform stand of sod grass. Sod shall be considered established when each piece of sod has generated root growth enough to maintain contact with the topsoil and provide a reasonable green cover, sufficient erosion control and a definite green appearance during the growing season.

3.5 PROTECTION

- A. Restrict pedestrian and vehicular traffic from sodded areas after planting and until grass is established and accepted.

3.6 REPAIRING/RESODDING

- A. Unaccepted areas requiring re-sodding shall be so designated by the Architect or Architect. Re-seeding and re-sodding shall be in compliance with the specifications herein and in accordance with the planting schedule.
- B. When sodded areas have become eroded or otherwise damaged during the period of this contract, the affected areas shall be repaired to re-establish the surface and condition of the soil as provided for in these specifications. Such areas shall be resodded as specified. Placing and reshaping of all earthwork shall be in accordance with the direction of the Architect.
- C. No additional payment will be made for refertilizing, re-sodding, remulching, or repairing eroded areas.

END OF SECTION

SECTION 02931 SEEDING, FERTILIZING AND MULCHING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and prepare lawn bed and seed, fertilize, and mulch those areas shown on the Drawings and as specified herein.
- B. Areas to be seeded shall be as designated on the Drawings and the following:
 - 1. All areas within the landscape limits shown on the Drawings but which do not receive sod. Landscape limits if not explicitly shown shall be equal to the limits of the property.

1.2 SUBMITTALS

- A. Submit to the Architect/Engineer, identification labels and certifications that all seed complies with the seed law of the State of Mississippi and current regulations.

PART 2 PRODUCTS

2.1 SEED

- A. Species to be established by seeding procedures:
 - Common Bermudagrass (permanent)
 - Perennial Rye (temporary application)
- B. The Contractor shall sow grass seed on all unpaved areas disturbed during construction which do not require sod. All seeding shall be completed in conformance with the Mississippi Department of Transportation (MDOT) Standard Specifications for Road and Bridge Construction, 2004 Edition. The grassed areas shall be mulched and fertilized in accordance with the MDOT Standard Specifications.

2.2 TOPSOIL

- A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during excavation, it shall be obtained off-site and provided by the Contractor. Topsoil shall be fertile, natural surface soil, capable of providing an adequate growing medium for all trees, plants, and grassing specified herein.
- B. Quality:
 - 1. Friable loam, cultivated locally, containing at least 2% decayed organic matter.

2. Shall not contain toxic materials, and shall be free of stones, clods, sticks, roots and other objectionable or extraneous materials or debris.

2.3 FERTILIZER

- A. Fifty percent of the elements derived from organic sources, to the following proportions: Nitrogen – 13%, Phosphoric acid – 13%, Soluble Potash – 13%.
- B. Fertilizer shall be dry, granular and bagged in manufacturer's original container.

2.4 WATER

1. Water used shall be free from injurious quantities of oil, acid, alkali, or vegetable matter; shall be reasonably clear, and shall not be brackish.
2. It shall be the Contractor's responsibility to supply all water to the site, as required during seeding operations and through the maintenance period and until the work is accepted. The Contractor will make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs of his work. He shall also furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of lawns and planted areas as may be required.

2.5 MULCH

- A. Vegetative straw material, either clean wheat, oat, rye or rice straw, free from weeds or debris. Use on areas to be seeded.
- B. Hydromulching: Wood cellulose fibers or paper chips may be utilized in place of the mulch/bituminous material method. Process may simultaneously apply seed and fertilizer along with the mulch; however, application methods and rates shall be approved by the Architect/Engineer.

2.6 AGRICULTURAL LIME

- A. Ground or pulverized, containing not less than 90% calcium carbonate and shall be ground to such a fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to planting seeds, topsoil (if specified), ground preparation, and fertilizing shall have been satisfactorily performed and the area approved by the Architect/Engineer.
- B. Seeding may be required for temporary protection of for establishment of permanent ground cover.

- C. Seeding shall not be done during windy weather or when the ground is frozen, extremely wet, or in an untillable condition.
- D. All seeds shall be covered lightly with soil by raking, rolling or other approved methods, and the area compacted.

3.2 FERTILIZING

- A. Fertilizer shall be applied in accordance with MDOT Specifications and mixed to the depth of preparation as soon as applied. It shall be applied mechanically or, if so authorized in writing by the Architect/Engineer, applied by approved hydraulic equipment.
- B. Fertilizer and agricultural limestone shall be applied separately but may be incorporated together.

3.3 MULCHING

- A. Mulching shall be placed uniformly on designated areas within 24 hours following seeding unless weather prohibits mulching operations.
- B. Mulch shall be placed loosely enough to allow air to circulate but compact enough to partially shade the ground and reduce erosion.
- C. In general, application methods shall be accordance with Section 215 of the MDOT Specifications.

3.4 WATERING

- A. When necessary, additional water shall be applied to seeded areas, including locations where trees, shrubs, and other vegetative plantings have been replanted or replaced, to supplement natural rainfall.
- B. Water shall be applied with approved sprinkling equipment that will spread water evenly and in a manner that will not cause erosion of the soil surface.
- C. Application of water shall be suspended during any period when temperatures are expected to drop below 35°F and shall be resumed when the weather moderates.

3.5 MAINTENANCE

- A. Soil should be kept continuously moist, but not too wet, until seed has germinated and become well established.
- B. Contractor shall mow and trim grass at regular intervals to maintain maximum height of 3 inches.

3.6 CLEANING

- A. Immediately clean spilled soil and planting materials from paved and finished surface areas.
- B. Remove debris and excess materials from project site.
- C. Any existing landscape items on adjacent property damaged or altered during construction by the Contractor shall be restored or replaced as directed by the Architect/Engineer.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 03300 - Cast-In-Place Concrete.

1.3 RELATED SECTIONS

- A. Section 03200 - Concrete Reinforcement.
- B. Section 03300 - Cast-in-Place Concrete.

1.4 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI 347 - Recommended Practice For Concrete Formwork.
- D. PS 1 - Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347.
- B. Maintain one copy of document on site.

1.7 QUALIFICATIONS

- A. Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Mississippi.

1.8 REGULATORY REQUIREMENTS

- A. Conform to International Building Code for design, fabrication, erection and removal of formwork.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.

1.10 COORDINATION

- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Softwood Plywood: PS 1, B Grade, Group 1, Exterior.
- B. Softwood Plywood: PS 1, HDO, Group I Exterior.
- C. Lumber: No. 2 grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

- A. Preformed Steel Forms: Tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces. Special care shall be used at areas of exposed concrete.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, adjustable length, free of defects that could leave holes larger than 1/2 inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Corners: Chamfer type; 3/4 x 3/4 inch.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

2.4 CARDBOARD VOIDS AND RETAINERS

- A. Cardboard voids shall be by Savway Carton Forms, Inc., SureVoid Products, Inc.,

or approved equal. Forms shall be impregnated with parafin and laminated with moisture resistant adhesive. Size as shown on drawings. Forms shall be designed to carry 1,000 pounds per square foot.

- B. Plastic retainers shall be by Savway Carton Forms, Inc., SureVoid Products, Inc., or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

- A. Earth forms are permitted for spread footings, interior grade beams and the interior face of perimeter grade beams. The exterior face of perimeter grade beams shall be formed.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Formwork ties for grade beams with exposed exterior shall be uniformly spaced horizontally and vertically.
- F. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- G. Provide chamfer strips on external corners of beams, columns and walls.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of

untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 6 times for concrete surfaces to be exposed to view.

3.9 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.10 SCHEDULE

- A. Grade B plywood for areas not exposed.
- B. HDO plywood for Grade Beams and wall to be exposed.
- C. Steel column forms for exposed concrete columns.

END OF SECTION

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Reinforcing steel bars and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

- A. Section 03100 - Concrete Formwork.
- B. Section 03300 - Cast-in-Place Concrete.
- C. Section 01415 - Special Inspections and Testing.

1.3 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements For Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- E. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- F. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- G. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- H. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- I. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
- J. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Contractor Quality Assurance:

1. Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, ACI SP-66, and ACI 318.
2. Maintain one copy of each document on site.
3. Submit certified copies of mill test report of reinforcement materials analysis.

1.6 STRUCTURAL SPECIAL INSPECTION AND TESTING

A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following inspections and tests:

1. Inspection of reinforcing steel for size, spacing, location and support.
2. Inspection of proper reinforcing steel concrete coverage.
3. Submit certified copies of mill test report of reinforcement materials analysis.
4. Welders' Certificates: If approved by the Engineer of Record, submit Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.7 QUALIFICATIONS

A. Welders' Certificates: Submit Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.8 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.
- B. Fiber Reinforcement: Similar and equal to Fibermesh InForce as manufactured by Synthetic Industries. Application rate shall be 1.5 pounds per cubic yard. Provide where shown on drawings.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI 318.
- B. When approved by Engineer of Record, weld reinforcement in accordance with ANSI/AWS D1.4 and ANSI/AWS D12.1.
- C. Locate reinforcing splices not indicated on drawings, at point of minimum stress.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings. Do not cut bars.
- D. Maintain concrete cover around reinforcing as per ACI 318.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cast-in-place concrete building members, floors, foundation walls, grade beams, footings, and etc.
- B. Floors and slabs on grade.
- C. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.
- D. Site concrete.

1.2 RELATED SECTIONS

- A. Section 03100 - Concrete Formwork: Formwork and accessories.
- B. Section 03200 - Concrete Reinforcement.
- C. Section 01415 - Special Inspections and Testing.

1.3 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 302 - Guide for Concrete Floor and Slab Construction.
- C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- D. ACI 305R - Hot Weather Concreting.
- E. ACI 306R - Cold Weather Concreting.
- F. ACI 308 - Standard Practice for Curing Concrete.
- G. ACI 318 - Building Code Requirements for Reinforced Concrete.
- H. ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.
- I. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- J. ASTM C33 - Concrete Aggregates.
- K. ASTM C94 - Ready-Mixed Concrete.

- L. ASTM C150 - Portland Cement.
- M. ASTM C260 - Air Entraining Admixtures for Concrete.
- N. ASTM C494 - Chemicals Admixtures for Concrete.
- O. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.4 SUBMITTALS

- A. Product Data: Provide data on joint devices, attachment accessories and admixtures.
- B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.6 QUALITY ASSURANCE

- A. Contractor Quality Assurance:
 - 1. Perform Work in accordance with ACI 301.
 - 2. Maintain one copy of each document on site.
 - 3. Acquire cement and aggregate from same source for all work.
 - 4. Conform to ACI 305R when concreting during hot weather.
 - 5. Conform to ACI 306R when concreting during cold weather.

1.7 STRUCTURAL SPECIAL INSPECTION AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections. Tests shall be performed in accordance with ACI 301.
 - 1. Verify correct design mix is provided.
 - 2. Perform a slump test as deemed necessary for each load of concrete. Record if water or admixtures are added to the concrete at the jobsite. Perform additional slump tests after job site adjustments.
 - 3. Mold four specifications per set for compressive testing; one set for each 100 or less cubic yards of each class concrete placed per day. Test one at 7

days, 2 at 28 days, and hold one as a spare to be broken as directed by the Architect/Engineer if compressive strengths do not appear adequate.

4. For each set of molded specimens record the following:
 - a) Slump
 - b) Temperature, ambient and concrete
 - c) Air content
 - d) Location of placement
 - e) Verification of correct design mix
5. Inspection of concrete placement for proper application techniques.
6. Inspection for maintenance of specified curing temperature and techniques.
- B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.
- C. Slab on Grade Floor Surface: Test floor flatness and levelness per ASTM E-1155. F_{F25}/F_L 18 minimum overall and F_{F18}/F_L 13 minimum local.

1.8 COORDINATION

- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- B. Coordinate all embedded items.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I or Type II.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494 Type F - Water Reducing, High Range added at job site after slump tests have been performed.
- C. Fly Ash: ASTM C618.

2.3 ACCESSORIES

- A. Vapor Retarder: Refer to other sections.

- B. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 5,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt.
- B. Sealant for Pavements, Sidewalks, Curb and Gutter: Silicone joint sealant Dow Corning 888 or approved equal.

2.5 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 2.
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1 or Method 2. Submit proposed mix design to Architect/Engineer in accordance with ACI 301.
- C. Provide concrete to the following criteria:
 - 1. Compressive strength: As noted on drawings or other specification sections.
 - 2. Slump: 3 to 5 inches.
 - 3. Water/Cement Ratio shall be .5 or below for all concrete.
- D. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
- E. Do not use calcium chloride.
- F. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.
- G. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318 and ACI 301.
- B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- D. Install joint devices in accordance with manufacturer's instructions.
- E. Construction joints in floor slabs and floor beams shall be located in the middle third of the span.
- F. Construction joints for grade beams shall be located at one third of the span beyond the support.
- G. Place concrete continuously between predetermined expansion, control, and construction joints.
- H. Do not interrupt successive placement; do not permit cold joints to occur.
- I. Slab on Grade Floor Surface: F_F 25/ F_L 18 minimum overall and F_F 18/ F_L 13 minimum local.

3.4 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- C. Place concrete floor toppings to required lines and levels.

3.5 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.
- B. Finish concrete floor surfaces in accordance with ACI 301.
- C. Wood float surfaces which will receive tile with full bed setting system.
- D. Steel trowel surfaces which will receive carpeting, resilient flooring, or seamless flooring.
- E. Steel trowel surfaces which are scheduled to be exposed.
- F. Pavements and sidewalks - light broom finish.

3.6 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces in accordance with ACI 308.

3.7 PATCHING

- A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Patch imperfections as directed in accordance with ACI 301.

3.8 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03600

FLOOR LEVELING COMPOUND

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for floor leveling where floors are not level to the specified requirements and/or where patching of concrete sub-floor is required in areas to receive floor finishes.
- B. The Contractor is required to patch and level floors, fill all depressions, cracks, and other uneven places in the concrete slab, at no additional cost, that do not meet the specified requirements. Floor shall be as required to receive floor coverings and comply with the manufacturer's installation requirements of the particular floor finish.

1.2 SUBMITTALS

- A. Submit manufacturers data, samples, laboratory test reports, and materials certificates.
- B. Submit qualifications and experience record of installer.

1.3 QUALITY ASSURANCE

- A. Installer shall be experienced in the installation of floor leveling grout.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide Emaco R300 CI repair mortar, a one-component thixotropic polymer-modified cement-based profiling mortar with an integral corrosion inhibitor, or approved equal.

2.2 MATERIALS

- A. Grout used for floor leveling shall be a one-component, light duty, cement based horizontal repair mortar cement material designed for patching and leveling floors.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- A. Remove all loose and imperfect material so as to expose good, clean, sound concrete. Remove all grease, oil, dust, dirt, paint and similar contaminants that will impair bond and performance. Once debris is removed, dampen surface before application. Do not leave any standing water. Follow manufacturer's

recommended surface preparation procedures.

3.2 MIXING AND APPLICATION

- A. Mix and install floor grout in strict compliance with manufacturer's printed instructions.

3.3 CURING AND PROTECTION

- A. Cure and protect topping applications and finishes as specified in manufacturer's literature.

3.4 PERFORMANCE

- A. Failure of grout to bond to substrate (as evidenced in part by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace in areas of such failures, as directed

3.5 CLEAN UP

- A. Clean up floor and surrounding areas prior to installation of floor finish materials.

END OF SECTION

SECTION 04065

MASONRY GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grout for masonry.

1.2 RELATED SECTIONS

- A. Section 01415 – Special Inspections and Testing.

1.3 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements For Masonry Structures; American Concrete Institute International.
- B. ACE 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International.
- C. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- F. ASTM C 387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
- G. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout.
- H. ASTM C 476 - Standard Specification for Grout for Masonry.
- I. ASTM C 1019 - Standard Test Method Sampling and Testing Grout.
- J. ASTM C 1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
- K. ASTM E 518 - Standard Test Methods for Flexural Bond Strength of Masonry.
- L. IMIABC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council.
- M. IMIABC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council.

1.4 SUBMITTALS

- A. Product Data: Include design mix and indicate whether the proportion or Property specification of ASTM C 270 is to be used.

- B. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C 476 and test and evaluation reports to requirements of ASTM C 1019.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.6 STRUCTURAL SPECIAL INSPECTION AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections.
 - 1. For masonry construction, verify compliance of:
 - a) Site prepared mortar proportions.
 - b) Construction of mortar joints.
 - c) Location of reinforcing and other imbeds.
 - 2. Inspection of:
 - a) Size and location of structural elements such as grout filled cells, lintels, bond beams, and etc.
 - b) Anchors and attachments to structural steel, floors, or other construction.
 - c) Reinforcement size and grade.
 - d) Protection of masonry during cold or hot weather.
 - 3. Grouting of masonry: Inspection shall include:
 - a) Grout space is clean and open.
 - b) Placement of reinforcing is accurate.
 - c) Site prepared grout proportions.
 - d) Construction of mortar joints is complete and correct.
 - 4. Grout placement inspection:
 - a) Continuous inspection during grout placement to ensure code and construction document compliance.
 - b) Continuous inspection of prisms, grout, or mortar specimens. Refer to Section 3.04.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).
- B. Hot Weather Requirements: Comply with IMIAWC(HW).

PART 2 PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Grout Aggregate: ASTM C 404.
- C. Water: Clean and potable.

2.2 GROUT MIXES

- A. Bond Beams; Lintels; and Block Filled Cells: 2500 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M; or mix in accordance with ASTM C 476.
 - 1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - 2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.3 GROUT MIXING

- A. Mix grout in accordance with ASTM C 94/C 94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

2.4 PRECONSTRUCTION TESTING

- A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01400.
- B. Grout Mixes: Test grout batches in accordance with ASTM C 1019 procedures.
 - 1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.1 PREPARATION

- A. Construct grout spaces free of mortar droppings, debris, loose aggregates, and any other material deleterious to masonry grout.
- B. Clean reinforcement by removing mud, oil, or other materials that will adversely affect or reduce bond at the time mortar or grout is placed.
- C. Brace masonry to resist wet grout pressure and assure stability of masonry during construction.

3.2 REINFORCEMENT INSTALLATION

- A. Support and fasten reinforcement together to prevent displacement when the grout is placed.
- B. Maintain clear distance between reinforcing bars and any face of masonry unit or formed surface. Do not bend reinforcement after it is embedded in grout or mortar.
- C. Place joint reinforcing as indicated on project drawings so that the longitudinal wires are embedded in mortar with a minimum of 5/8" cover.

3.3 GROUT PLACEMENT

- A. Perform all grouting by means of "low-lift grouting" where cleanouts are not required.
- B. Low-Lift Grouting:
 - 1. The masonry wall is built to scaffold height or to a bond beam course, to a maximum of five (5) feet.
 - 2. Verify that horizontal and vertical reinforcement is in the proper position and adequately secured before beginning pours.
 - 3. Project steel reinforcement above the top of the pour for sufficient height to provide the minimum lap splice required.
 - 4. Place grout within 1½ hours from introducing water in the mixture and prior to initial set.
 - 5. Consolidate grout at the time of placement.
 - a. Consolidate grout pours 12 inches or less in height by mechanical vibration or puddling.
 - b. Consolidate pours exceeding 12 inches in height by mechanical vibration only, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
 - 6. Place grout for spanning elements in single, continuous pour.

3.4 FIELD QUALITY CONTROL

- A. An independent testing agency will perform fixed tests, in accordance with provisions of Section 01400.
- B. Test and evaluate grout in accordance with ASTM C 1019 procedures.
 - 1. Test frequency: One per each cubic yard of grout.
- C. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C 1314, and for flexural bond strength in accordance with ASTM C 1072 or ASTM E 518; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for concrete masonry units, brick masonry, mortar, and related accessories. The extent of each type of unit masonry work is shown on the drawings.

1.2 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where a fire-resistance classification is shown or scheduled for unit masonry, provide materials and construction identical to those of assemblies with fire-resistance ratings determined in accordance with ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- B. Obtain like masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.
- C. Job Mock-up:
 - 1. Within two weeks of masonry and mortar sample approval erect wall panel mock-up with actual materials, bond, and joint tooling shown or specified for final work. Build mock-up at the site, where directed, of full thickness and approximately 4 feet x 3 feet.
 - 2. Provide special features as directed for caulking and contiguous work. The mock-up shall contain a corner, rowlock, soldier course, weeps, reinforcing, anchors, and any other features common to this project and shall indicate the proposed range of color, texture and workmanship to be expected in the completed work.
 - 3. Obtain Architect's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until work is completed.
- D. Brick unit masonry installation shall comply with the latest edition of Technical Notes on Brick Construction by the Brick Institute of America.
- E. Concrete unit masonry installation shall comply with the latest edition of the Concrete Masonry Handbook by the Portland cement Association.
- F. Masonry subcontractor shall have a minimum of 5 years experience in the installation of masonry units and shall have successfully completed projects of similar size and scope of the work of this project.

- G. Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- H. Concrete unit masonry shall be tested for each type of masonry unit required in accordance with ASTM C 140.
- I. Concrete unit masonry installation shall comply with recommendations of:
 - 1. Concrete Masonry Handbook, PCA, 1991
 - 2. TEK Manual for Concrete Masonry for Concrete Masonry Design and Construction, NCMA

1.3 SUBMITTALS

- A. Submit manufacturer's product data, specifications and other data for each type of masonry unit and accessory required including certification that each type complies with the specified requirements. Include instructions for handling, storage, installation and protection of each.
- B. Submit one sample of brick masonry showing a representative range of color and texture variation.
- C. Submit building elevation drawings indicating location of expansion control joints in accordance with BIA and NCMA guidelines.
- D. Submit masonry subcontractor qualifications, as well as the qualifications of the individuals performing the work, indicating work experience, certifications, training, references and list of successfully completed projects of similar size and scope of the work of this project.
- E. Submit manufacturers certification on all fire rated masonry products requiring a fire resistance rating that installed products meet specified fire ratings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store 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 masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 JOB CONDITIONS

- A. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Comply with hot-weather construction requirements contained in:
 - 1. ACI 530.1/ASCE 6/TMS 602
 - 2. The latest edition of NCMA publication TEK 3-1C, All Weather Concrete Masonry Construction.
- D. Protect partially completed masonry against weather, when work is not in progress, by covering top of walls with strong, waterproof, nonstaining membrane. Extend membrane at least two (2") inches down both sides of walls and anchor securely in place.
- E. Protect masonry against freezing when the temperature of the surrounding air is 40 degrees F. and falling. Heat materials and provide temporary protection of completed portions of masonry work. Comply with the requirements of the governing code and with the "Construction and Protection Recommendations for Cold Weather Masonry Construction" of the Technical Notes on Brick and Tile Construction by the Brick Institute of America (BIA).

PART 2 PRODUCTS

2.1 BRICK MASONRY UNITS

- A. Unless otherwise indicated on drawings, provide modular size brick 7 5/8 inch long X 2 1/4 inch high X 3 5/8 inch wide for exposed brickwork. At Contractor's option, provide solid or cored brick for brickwork. Do not use cored brick for vertical brickwork. Do not use cored brick with net cross-sectional area less than 75 percent of gross area in the same plane or with core holes closer than 3/4 inch from any edge.

- B. Face Brick: ASTM C 216, Grade SW or MW for other exposures.
 - 1. Manufacturer: Cherokee Brick & Tile
 - 2. Name: Vel Medium Gray
- C. Building (Common) Brick: Brick not exposed to view, ASTM C 62, Grade SW for exterior exposures, Grade MW for exposed interior work (where allowable) and Grade NW for interior masonry which will be concealed by other work. Select from manufacturer's standard colors and textures.
- D. Special Shapes: Provide special shapes, including sills, as shown on the drawings, matching the above facing brick specifications.

2.2 CONCRETE MASONRY UNITS

- A. Manufacturer's standard units with nominal face dimensions of 16 inches long X 8 inches high and nominal thickness as indicated on drawings. Provide special shapes where shown and where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
- B. Standard, light weight, concrete masonry units shall have a minimum average net-area compressive strength of 1900 psi complying with ASTM, C 90. Provide manufacturer's standard color and texture, unless otherwise indicated.
- C. Curing: Cure units in a moisture-controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90 Type 1.
- D. Exposed Face: Provide manufacturer's standard color and texture, unless otherwise indicated.

2.3 MORTAR MATERIALS

- A. Portland Cement, ASTM C 150 Type 1, except Type III may be used for cold weather protection. Mortar color for face brick shall be as selected by the Architect from manufacturer's standard colors. Mortar color for common brick and concrete masonry units shall be natural color or white cement as required to produce the required standard mortar color.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144, except for joints less than 14 inches, use aggregate graded with 100 percent passing the No. 16 sieve.

2.4 MASONRY REINFORCING

- A. Provide welded wire units prefabricated in straight lengths of not less than 10 feet, with matching corner and tee units. Fabricate from Cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain

cross-rods, crimped for cavity wall construction (if any), and a unit width of 1 1/2 inch to 2 inches less than thickness of wall or partition. Provide units fabricated with single pair of 9 gage side rods and 9 gage perpendicular cross-rods spaced not more than 16 inches on center. For composite exterior walls with concrete masonry back-up, fabricate units with additional side rod spaced for embedment in inside face of back-up wythe. All units shall be hot-dip galvanized after fabrication.

2.5 MASONRY VENEER ACCESSORIES

- A. Flexible 2-piece anchors consisting of trapezoidal-shaped wire tie and 12 gage 3/4 inch wide x 9 inches long strap formed with 3/8 inch offset and screw holes top and bottom for screw attachment to metal studs. Size tie to extend within 3/4 inch of face of masonry veneer. Fabricate from steel with hot-dip galvanized coating, ASTM A 153, Class B-2.
- B. Miscellaneous Anchoring Devices for Masonry: Provide straps, bars, bolts and rods fabricated from not less than 16 gage sheet metal or 3/8 inch diameter rod stock, hot dipped galvanized, unless otherwise indicated.
- C. Concrete Inserts for Masonry: Furnish dovetail slots with filler strips, where masonry abuts concrete. Fabricate from 24 gage all galvanized steel unless otherwise indicated.
 - 1. For installation of concrete inserts, see concrete sections of these specifications. Advise concrete installer of specific requirements regarding his placement of inserts which are to be used by the masonry installer for anchoring of masonry work. When installing inserts avoid contact with any adjacent reinforcing steel.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. Provide premolded compressible neoprene filler strips, where indicated on drawings, complying with ASTM D 1056, Grade 2A1. Filler strips shall be compressible up to 35 percent of width and thickness indicated.
- B. Provide preformed control-joint gaskets, where indicated on drawings, made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall. Gasket size and configuration shall be as indicated on drawings.
- C. Provide bond-breaker strips of asphalt-saturated organic roofing felt complying with ASTM D 226, Type I.
- D. Provide weep material, equal to Mortar Net Weep/Vents, made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe. Color shall be selected from manufacturer's standard.

- E. Provide cavity drainage material, where indicated on drawings, made from polymer strands that will not degrade within the wall cavity, equal to Mortar Net Strips. Cavity drainage material shall be full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.

2.7 FLASHINGS FOR MASONRY

- A. Provide concealed flashings, shown to be built into masonry, as specified in Section 07600, Flashing and Sheet Metal, unless otherwise indicated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Masonry installer must examine the areas and conditions under which masonry is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to masonry installer.

3.2 INSTALLATION

- A. Building masonry construction to the full thickness shown, except, build single-wythe walls where indicated to the actual thickness of the masonry units, using units of nominal thickness shown or specified.
- B. Build chases and recesses as shown and as required for the work of other trades. Provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- C. Cut masonry units with motor-driving saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.
- D. Wet brick having ASTM C67 absorption rates greater than 0.025 oz. per square inch per minute. Determine absorption by drawing a circle the size of a quarter on typical units and place 20 drops of water inside the circle. Wet brick units only if water is absorbed within 1.5 minutes.
 - 1. Do not wet concrete masonry units.
- E. Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry which is specified to be wetted, comply with the BIA recommendations. Do not use calcium chloride in mortar or grout.
- F. Pattern Bond: Lay masonry work in a running bond unless indicated otherwise.
- G. Layout walls in advance for accurate spacing of surface bond patterns with

uniform joint widths and to properly locate openings movement type joints, return and offsets. Avoid the use of less-than half-size units at corner, jambs and wherever possible at other locations. Lay-up walls plumb and true and with courses level, accurately spaced and coordinated with other work.

- H. Stopping and Resuming Work: Rack back 1/2 masonry unit length in each course. Do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted), and remove loose masonry units and mortar prior to laying fresh masonry. Cover and protect tops of walls and structures from rain water intrusion.
- I. Built-in Work: As the work progresses, build in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items. Fill space between hollow metal frames and masonry solidly with mortar.

3.3 MORTAR BEDDING AND JOINTING

- A. Mortar Mixes: ASTM C 270, Proportion Specifications, and of the following type:
 - 1. Type S for exterior work.
- B. Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clear and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2 1/2 hours has elapsed since initial mixing. Retemper mortar during 2 1/2 hour period as required to restore workability.

3.4 LAYOUT

- A. Lay brick and other solid masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.
- C. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool exposed joints slightly concave. Rake out mortar in preparation for application of caulking or sealants where shown.
- D. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

3.5 CAVITY WALLS

- A. Keep cavity clean of mortar droppings during construction. Strike joints facing cavity, flush.
- B. Tie exterior wythe to back-up with continuous horizontal joint reinforcing embedded in mortar joints at not more than 16 inches on center vertically.
- C. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing spaced 2'-0" on center, unless otherwise shown.

3.6 HORIZONTAL JOINT REINFORCING

- A. Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum of cover of 5/8 inch on exterior side of walls and 1/2 inch at other locations. Lap reinforcement a minimum of 6 inches at ends of units. Do not bridge control and expansion joints with reinforcing except at wall openings. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions. Space continuous horizontal reinforcing as follows:
 - 1. For multi-wythe walls (solid or cavity) where continuous horizontal reinforcing also acts as structural bond or tie between wythes, space reinforcing as required by code but not less than 16 inches on center vertically.
- B. Reinforce masonry opening greater than 1'-0" wide, with horizontal joint reinforcing placed in 2 horizontal joints approximately 8 inches apart, both immediately above the lintel and immediately below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of the opening, bridging control joints where provided.

3.7 ANCHORING MASONRY WORK

- A. Provide anchoring devices of the type shown and as specified. If not shown or specified, provide standard type for facing and back-up involved. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
 - 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise shown. Keep open space free of or other rigid materials. Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible tie sections unless otherwise shown. Space anchors as shown, but not more than 24 inches on center horizontally.

3.8 ANCHORING BRICK VENEER WORK

- A. Provide anchoring devices of the type shown and as specified. If not shown or specified, provide standard type recommended by B.I.A. for facing and back-up involved. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
1. Anchor brick veneer masonry to structural members with metal ties embedded in masonry joints and attached to structure. Space anchors at a minimum of 24 inches on center horizontally and 16 inches vertically. All ties are to be embedded at least 2 inches into the bed joints of the brick veneer. Additional ties shall be installed at approximately 8 inches on center at jambs and other openings and near edges, and 8 inches above the brick ledge and 8 inches below the highest point in the wall.
 2. Anchor brick veneer to metal studs with 2-piece anchors specified. Fasten strap section through sheathing to metal studs with S-12 Pancake Head Screws (Cadmium plated). Embed tie section in masonry joints.
 3. Anchor brick veneer to steel structure where required, with anchors as described above, welded to steel.
 4. Anchor brick veneer to concrete back-up with anchors as described above, with drilled expansion bolts to concrete. Expansion bolts as approved by the architect.

3.9 LINTELS

- A. Install loose steel lintels or other lintels where shown.

3.10 CONTROL AND EXPANSION JOINTS

- A. Provide vertical expansion, control and isolation joints in masonry. Build-in related masonry accessory items as the masonry work progresses. Rake out mortar in preparation for application of caulking and sealants.
- B. Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 50'-0" on center for concrete masonry wythes if reinforced, or 30'-0" on center if not reinforced. Locate control joints at points of natural weakness in the masonry work.

3.11 FLASHING OF MASONRY WORK

- A. Provide concealed flashings in masonry work as shown. Prepare masonry surfaces smooth and free from projections which might puncture flashings. Place through-wall flashing on bed of mortar and cover with mortar. Seal flashing penetrations with mastic before covering with mortar. Terminate

flashing 1/2 inch from face of wall, unless otherwise shown. Extend flashings beyond edge of lintels and sills (if any) at least 4 inches and turn up edge on sides to form pan to direct moisture to exterior. Provide weep holes in the head joints of the first course of masonry immediately above concealed flashings, spaced 24 inches on center unless otherwise shown. Install flashings in accordance with manufacturer's instructions.

- B. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.12 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken stained or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match units and install a fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat uniform appearance, properly prepared for application of caulking or sealant compounds.
- C. Clean exposed brick masonry surfaces as recommended by BIA Technical Notes 20 "Cleaning Clay Products Masonry".
- D. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.
- E. Clean CMU by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.13 PROTECTION

- A. Protect finished masonry work from subsequent damage and soiling until final acceptance.

END OF SECTION

SECTION 05100

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel, embedded items, and miscellaneous steel.
- B. Fabrication shop coat painting.
- C. Steel erection.

1.2 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications.
- B. Section 09900 - Painting.
- C. Section 01415 - Special Inspections and Testing.

1.3 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- D. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- F. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- G. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- H. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A992 - Structural Steel, Grade 50.
- J. AWS A2.0 - Standard Welding Symbols.
- K. AWS D1.1 - Structural Welding Code.
- L. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- M. SSPC - Steel Structures Painting Council.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate sizes, spacing, and locations of structural members.
 - 2. Connections.
 - 3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
- B. Mill Test Reports: Submit indicating structural strength.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Provide ultrasonic testing reports for all complete penetration shop welds.
- B. Maintain one copy of each document on site.

1.6 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections:
 - a) Anchor bolts
 - b) Anchor bolt size, configuration, and embedment shall be verified prior to placement of concrete.
- 2. Inspect identification markings for compliance.
- 3. Review Manufacturer's Certificate of Compliance.
- 4. Review certified mill test reports.
- 5. Bolted connections
 - a) Inspection and testing shall be in accordance with AISC specifications for Structural Joints using ASTM A325 or A490 Bolts.
 - b) Provide periodic inspection of all bearing type bolted connections and continuous inspection of slip critical connections. Slip critical connections, if any, will be specifically noted on drawings.
- 6. Field welded connections
 - a) Inspection shall be in accordance with AWS Structural Welding Code.
 - b) Visually inspect all field welded connections. Provide continuous inspection for complete and partial penetration groove welds; multi-pass fillet welds; single-pass fillet welds greater than 5/16". Provide periodic inspection for fillet welds equal to or less than 5/16"; and joist, floor and deck welds.
 - c) Provide ultrasonic inspection of all complete penetration welds.
 - d) Verify welder qualifications.
 - e) Review weld filler material markings for compliance.
 - f) Review Manufacturer's Certificate of Compliance.

7. Inspection of steel frame joint details for compliance with approved construction documents.
 - a) Details
 - b) Member location
 - c) Joint details at each joint

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel Members:
 1. W Shapes: ASTM A992 (Grade 50).
 2. Angles, Channels, Plates: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Pipe: ASTM A53, Grade B.
- D. Shear Stud Connectors: ASTM A108 forged steel, headed.
- E. Bolts, Nuts, and Washers: ASTM A325; galvanized to ASTM A123 for galvanized members.
- F. Anchor Bolts: ASTM A307.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 5000 psi at 28 days.
- I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic.

2.2 FABRICATION

- A. Provide shop workmanship equal to the best modern practice conforming to listed industry standard and in accordance with the latest requirements of the American Institute of Steel Construction.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 2.
- B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, and high strength bolted connections.
- C. Galvanize to ASTM A123, structural steel members indicated on drawings. Provide minimum 1.25 oz/sq.ft.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings or shop drawings.
- C. All exposed welds shall be ground smooth.
- D. Do not field cut or alter structural members without approval of Engineer.
- E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.3 ERECTION TOLERANCES

- A. All erection of steel, bracing and etc. should be as required by AISC.

END OF SECTION

PART 1 GENERAL**1.1 SECTION INCLUDES**

- A. Open web steel joists, with bridging, attached seats, and anchors.

1.2 RELATED SECTIONS

- A. Section 05100 - Structural Steel.
- B. Section 05300 - Steel Deck.
- C. Section 09900 - Painting.

1.3 REFERENCES

- A. ASTM A307 - Carbon Steel Threaded Standard Fasteners.
- B. AWS D1.1 - Structural Welding Code.
- C. FS TT-P-636 - Primer Coating, Alkyd, Wood and Ferrous Metal.
- D. SJI - Standard Specifications for Open Web Steel Joists, K Series.
- E. SSPC - Steel Structures Painting Council.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1) Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
 - 2) Bridging, connections.
 - 3) Cambers.
- B. Welder's Certificates: Submit manufacturer's certificates that welders employed on the Work have met AWS verification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SJI Standard Specifications, Load Tables, and Weight Tables.
- B. Maintain one copy of each document on site.

1.6 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections:

- 1) Inspection of all welds or bolts of steel joist to other steel members.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products to SJI requirements.
- B. Protect joists from distortion or damage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Open Web Joists Members: SJI Type K open web.
- B. Nuts and Washers: ASTM A307.
- C. Primer: FS TT-P-636.
- D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36.
- E. Welding Materials: AWS D1.1; type required for materials being welded.

2.2 FABRICATION

- A. Provide bottom and top chord extensions as indicated.

2.3 FINISH

- A. Shop prime joists. Do not prime surfaces that will be field welded.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- A. Erect and bear joists on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.
- C. Coordinate placement of anchors in masonry.
- D. After joist alignment and installation of framing, field weld joist seat to bearing plates.
- E. Position and field weld joist chord extensions and wall attachments after dead load is applied.

- F. Do not permit erection of decking until joists are braced, bridged, and secured.
- G. Do not field cut or alter structural members without approval of joist fabricator.
- H. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/2 inch.

END OF SECTION

SECTION 05300

STEEL DECK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Steel deck and accessories.

1.2 RELATED SECTIONS

- A. Section 05100 - Structural Steel.

1.3 REFERENCES

- A. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM 36 - Structural Steel.
- C. ASTM A466 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- D. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot Dip Process.
- E. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.
- F. AWS D1.1 - Structural Welding Code.
- G. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.

1.4 PERFORMANCE REQUIREMENTS

- A. Design metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate decking plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.
- B. Product Data: Provide deck profile characteristics and dimensions, structural properties and finishes.
- C. Manufacturer's Installation Instructions: Indicate specific installation sequence.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products from damage.
- B. Cut plastic wrap to encourage ventilation.

- C. Separate sheets and store decking on dry wood sleepers; slope for positive drainage.

1.7 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

- A. Inspection of all welds and/or other attachment to steel members.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sheet Steel: ASTM A446, Grade A Structural Quality; with G90 galvanized coating conforming to ASTM A525.
- B. Bearing Plates: ASTM A36 steel.
- C. Welding Materials: AWS D1.1.
- D. Touch-Up Primer: Zinc chromate type.

2.2 FABRICATION

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

Span Design:	Multiple

Minimum Metal Thickness (Excluding Finish):	as shown on drawings

Nominal Height:	as shown on drawings

- B. Metal Closure Strips, Cover Plates, and Related Accessories: 20 gage galvanized sheet steel; of profile and size as required.
- C. Fasteners: Galvanized hardened steel, steel-tapping.
- D. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Erect metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks.
- B. Bear decking on steel supports with 1-1/2 inch minimum bearing. Align and level.

- C. Fasten deck to steel support members per drawings.
- D. Weld in accordance with AWS D1.1.
- E. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for necessary to complete the furnishing and installation of all cold-formed framing as shown, detailed and otherwise required.

- 1. Cold-formed metal framing shall include:

- a. Exterior non-load bearing wall framing, bracing, furring, soffit framing, supports, and related work indicated.
 - b. Including studs, channels, related support and bracing members, and other accessories as required for a complete installation as indicated on drawings.

1.2 PERFORMANCE REQUIREMENTS

- A. Cold-formed framing system shall meet or exceed requirements of the Governing Building Code in the jurisdiction in which the project is located. Structural design of the system shall be the responsibility of the manufacturer.
 - 1. The out-of-plane deflection for brick veneer walls shall not exceed the cold-formed framing members span length divided by 600 ($L/600$).
- B. Design framing systems to provide for movement of framing members without damage or over stressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F.

1.3 SUBMITTALS

- A. Submit installers qualifications and training including list of successfully completed projects similar in size and scope to the work of this project.
- B. Submit product data.
- C. Submit fabrication and erection drawings for review and approval showing all erection procedures and accessories required. Drawings shall indicate all framing conditions and connections required to fully describe the cold-formed framing system including but not limited to plans, sections, elevations, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
- D. Submit certification stating that the system is designed to meet all governing codes and loading requirements. The drawings shall be prepared and stamped

by a registered professional engineer licensed in the State of Mississippi.

1.4 QUALITY ASSURANCE

- A. Preparation of shop drawings, design calculations, and other structural data shall be performed by a qualified engineer who is a registered professional engineer licensed in the State of Mississippi and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- B. The cold-formed metal framing installer shall have a minimum of five years experience and shall have successfully completed cold-formed metal framing similar in material, design, scope and extent to the work of this project.
- C. Welding: Quality procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Comply with AISI's Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold formed metal framing. Comply with CCFSS Technical Bulletin: AISI Specification Provisions for Screw Connections.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect cold formed metal framing members from corrosion, deformation or other damage during deliver, storage and handling in accordance with industry standards and manufacturer's recommendations.
- B. Store cold formed metal framing members protected with a weatherproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide cold-formed metal framing products equal to ClarkDietrich Building Systems or approved equal.

2.2 MATERIALS

- A. All cold-formed stud and framing members shall be of the type and size as indicated on the drawings. All runner and end tracks, bridging and related items shall be of the type and size required and as indicated on the drawings.
- B. Cold-formed steel sheet shall comply with ASTM A 1003/A 1003M unless indicated otherwise.
- C. Studs shall be ASTM A 653/653 M steel, ASTM C645 G90 galvanized , channel shaped with lipped flanges, punched web, size as shown on drawings, thickness and grade as required by structural design calculations.

- D. Tracks shall be ASTM A 653/653 M steel, same designation, coating, and thickness as studs except as otherwise noted, channel shaped, solid web, depth compatible with studs, size, thickness and grade as required by structural design calculations.

2.3 ACCESSORIES

- A. Provide all bolts, clips, screws, anchors and other related accessories for a complete cold-formed framing system as indicated on drawings, shop drawings and as required by structural design calculations.

2.4 FABRICATION

- A. Framing components may be prefabricated into panels prior to erection. Prefabricated panels shall be square with components attached by welding to prevent racking. Handling and lifting of panels shall be done in a manner as to not cause distortion in any member.
- B. All framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.
- C. Axial loaded bearing studs shall be installed in a manner which will assure that stud ends are positioned against the inside track web prior to stud and track attachment.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine condition of concrete slab, steel structure and other related surfaces prior to installation and do not proceed until any defects are corrected.

3.2 INSTALLATION

- A. Install cold-formed framing, fasteners, trim and accessories in conformance with approved shop drawings and manufacturer's installation instructions.
- B. Install exterior stud track on a continuous bead of silicone sealant located approximately one inch from the inside surface of the vertical leg.
- C. Install all exterior studs at 16 inches on center maximum spacing.

3.3 ERECTING FOR WINDLOAD MEMBERS

- A. Tracks shall be securely anchored to the supporting structure in a manner which will transfer imposed load.
- B. Studs shall be plumbed, aligned and securely attached to each side of the flange or web of the top and bottom tracks.

- C. At track butt joints, abutting pieces of track shall be securely anchored to common structural element, or they shall be butt welded or spliced together.
- D. Splices in wind loaded only studs shall be avoided if possible. When necessary, splice sections shall be of same or heavier size, a minimum of 18 inches long and attached in a manner to maintain original strength.
- E. Jack studs shall be installed below window sills, above window and door headers, at free standing stair rails, and elsewhere to furnish structural support and shall be securely attached to supporting members.
- F. Wall stud bridging shall be installed in accordance with manufacturer's recommendations.
- G. Provision for structure vertical movement shall be provided where required using the manufacturer's standard vertical slide clip or other means in accordance with manufacturer's recommendations.

3.4 ERECTING FOR AXIAL LOAD BEARING MEMBERS

- A. Tracks shall be securely anchored to the supporting structure to properly transfer imposed loads.
- B. Complete, uniform and level bearing support shall be provided for the bottom track at each bearing stud location. If not provided, install full size shims below bottom track at stud locations as needed or set bottom track in high strength grout.
- C. At intersection or abutting track joints, abutting pieces of track shall be securely anchored to a common structural element, or they shall be spliced together.
- D. Splices in axial loaded studs shall not be permitted.
- E. Framed wall openings shall include a properly designed header and multiple (or heavier) studs at each edge of the opening, to compensate for those removed.
- F. Diagonal bracing shall be installed at locations required to be "shear walls" for frame stability and to resist wind lateral loads. Bracing shall be securely anchored for uplift and horizontal shear. Additional studs shall be positioned to resist the vertical component.
- G. Bridging for wall framing shall be installed in accordance with manufacturer's recommendations and as indicated on approved shop drawings.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for providing labor, materials and equipment necessary to complete the furnishing and installation of miscellaneous metal work indicated on the drawings and specified.

1.2 FIELD MEASUREMENTS

- A. The Contractor shall make measurements in the field to verify or supplement dimensions shown on the drawings and he shall be responsible for proper measurements and fit of all items.

1.3 SUBMITALS

- A. Submit shop drawings for work in this Section. Shop drawings shall show every different size, shape and type of member to be supplied. Submit shop drawings including plans, elevations, details, methods of installation and anchoring for all pieces and systems supplied. All dimensions shall be shown, including every hole, fastening, bearing member and the like. No work shall be fabricated prior to Architect's approval of shop drawings. Sets shall be furnished as necessary for the work of other trades. Approval of shop drawings shall be general and shall not relieve the Contractor of dimension errors.
- B. Submit representative samples of each type of miscellaneous metal exposed to view for approval. Samples shall include but not be limited to all steel shapes, fabricated items and connectors including screws and bolts. Samples shall show each type of typical connection and weld where applicable.
- C. Submit contractor/fabricator qualifications including list of successfully completed projects of similar size and scope of the work of this project.
- D. Submit copies of welding certificates for procedures and personnel.

1.4 PERFORMANCE REQUIREMENTS

- A. 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.

1.5 QUALITY ASSURANCE

- A. Subcontractor/installer of metal fabrications specified in this Section shall have a minimum of 5 years experience in the fabrication and installation of work similar in size and scope of the work of this section.
- B. Certify that each welder has satisfactorily passed AWS welding test for welding processes involved and, if pertinent, has undergone rectification.
- C. Comply with applicable provisions of local building code, ADAAG and ANSI A117.1 as applicable to the work of this section.

1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate preparation of galvanized steel products to be primed and painted. Comply with paint and coating manufacturers' written recommendations to ensure that galvanized steel preparation is such that primers and topcoats have proper adhesion.
- C. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.7 WARRANTY

- A. Provide manufacturer's one year warranty against defective material and workmanship for all manufactured items.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural shapes shall be standard sections conforming to ASTM Specification A-36. Punch and drill as necessary for work of others. Provide all bearing plates and all anchors, bolts, anchoring or support devices. Steel and iron work, when finished, shall be true and free of twists, bends and open joints between component parts. Materials shall be thoroughly straightened in the shop before laid off or worked in any way, using care to avoid injury to the material.
- B. Iron casting shall be made from fine, tough gray iron, free of all cold cuts, blow and sand holes, honeycomb, seams, and other defects. Castings shall be true to pattern and all moldings and edges clean and sharp and of first-class workmanship finish.
- C. Expansion bolts shall be equal to Trubolt Wedge Anchors as manufactured by ITW/ Ramset/Red Head. Use toggle type bolts or similar for all anchorage into hollow construction.
- D. Provide necessary lugs and brackets for anchorage. Welding shall be in accordance with current "Code of Fusion, Welding and Gas Cutting in Building Construction, Part A - Structural Steel" issued by the American Welding Society, both for fabrication and erection. All welders shall have certification, as a result of tests prescribed by the American Welding Society.
- E. Detail metal work for ample size, strength and stiffness and as indicated. Countersink and provide reinforcement where necessary. Fill or punch holes for bolts and screws. At the proper time, furnish the necessary templates, patterns and items of miscellaneous metal, such as sleeves, inserts and similar items to be built into adjoining work.
- F. Fabricate metal work with sharp lines and angles, with smooth true surfaces and clean edges. Form exposed joints to exclude water. Furnish certificates from manufacturers stating that materials comply with the specification requirements.
- G. Provide as necessary holes of proper number and spacing for the attachment of work of other trades. Do not use cutting torch in field without permission of the

Architect.

- H. Anchor bolts, washers, nuts and clamps shall be furnished where indicated on the drawings and where necessary for properly securing work in place. All bolts and anchors used on the exterior of the building or built into exterior walls shall be cadmium plated. Furnish screws, bolts and other threaded fasteners as manufactured by Hilti or equal
- I. Miscellaneous angles and plates not indicated or specified otherwise shall not be less than 1/4 inch thick.
- J. Provide galvanized loose steel lintels at locations indicated on drawings. Size, shape, and bearing shall be as indicated on lintel schedule.
- K. Shop paint and field touch up shall be Tnemec 99 commercial primer or approved equal.
- L. Fastenings shall be invisible where possible. Exposed screws, bolts and the like shall be vandal-proof. All welded exposed joints on steel manufactured items, shall be ground smooth and filled to receive paint.

2.2 FABRICATION, GENERAL

- A. Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.3 SPECIAL FABRICATIONS, TRASH CAN ENCLOSURE

- A. Construct a 7'-0" wide 4'-0" deep by 4'-0" tall steel angle framed trash can enclosure at location indicated on drawings. Angles shall be continuous at perimeter of enclosure at top and bottom. Provide vertical angles at corners and at 2'-0" O.C. Bottom angle shall be pre-drilled with 3/4 inch diameter holes at each corner and at 2'-0" spacing for bolting to concrete slab. Fully weld all connections and galvanize entire unit after fabrication. Screw attach vertical metal panels to top and bottom angles with concealed fasteners. Install a metal trim drip edge at bottom of panels, cap at top of panels, and corner trim at outside corners. Trim shall match panel finish.
 1. Angles: 3x3x1/4
 2. Bolts: 1/2 diameter x 4 inch long minimum expansion or chemical anchor bolts with washers equal to products of Hilti Fastener.
 3. Panels: See Section 07421 - Prefromed Metal Panels
 4. Flashing: See Section 07600 - Flashing and Sheet Metal
- B. Perforated metal screen panel equal to products of McNichols.
 1. Round Hole, Stainless Steel Type 316L, 16 Gauge, Mill Finish, 1/4 inch diameter holes on 5/16 inch centers, staggered pattern, 58 percent open area. Provide stainless steel perimeter angle frame for mounting to wall opening at louver L-1. Size as required for finish opening.

2.4 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.5 LOOSE LINTELS

- A. Provide loose galvanized steel lintels for openings and recesses in masonry walls and partitions. Weld adjoining members together to form a single unit where indicated. Provide a minimum of 8 inches bearing at each side of openings. Paint to match adjacent masonry. Color shall be as selected by Architect

2.6 BOLLARDS

- A. Bollard (Type 1):
 1. Fabricate steel pipe bollards located outside of the building from 6 inch

diameter steel pipe, ASTM A 53, Type E or S, Grade A, Schedule 40, fully galvanized. Shape, size, and installation as indicated on drawings. Fill with concrete and round tops smooth between 1 inch and 2 inches above top of steel pipe. Paint color to be selected by Architect.

B. Bollard (Type 2):

1. Provide bollards inside Apparatus Bay equal to Calpipe Security Bollards, 19440 Dominguez Hills Drive, Rancho Dominguez, CA.
Tel: 866-238-8518 Web: calpipebollards.com
 - a. Bollards shall be 6 diameter Schedule 40 powder coated steel with cap and welded 10 inch x 10 inch base plate. Provide (4) four, high strength, 5/8 inch diameter x 6 inch long stainless steel hook type anchor bolts for each bollard.
 - b. Color: To be selected by Architect from manufacturer's full range of 180 available powder coat colors.

2.7 GALVANIZING

- A. All steel components and fabrications indicated to be galvanized shall be hot dipped galvanized conforming to the following specifications and standards:
 1. ASTM A 123 - Specification For Zinc (Hot-Dip Galvanized) Coatings On Iron And Steel Products
 2. ASTM A 153 - Specification For Zinc Coating (Hot-Dip) On Iron And Steel Hardware
 3. ASTM A 385 - Practice For Providing High-Quality Zinc Coatings (Hot-Dip)
 4. ASTM A 780 - Practice For Repair Of Damaged And Uncoated Areas Of Hot-Dip Galvanized Coatings.
 5. ASTM D 6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- B. Steel components in exterior locations and in wet areas shall be galvanized, including concealed work.
- C. Galvanizing of steel components to be painted shall be done in a manner to facilitate proper adhesion of primers.

2.8 DISSIMILAR MATERIALS

- A. Where materials come in contact with dissimilar materials which may cause harmful reaction when exposed to moisture, such as aluminum to cement mortar or concrete, the surface shall be protected by an approved protective paint.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

- A. Perform cutting, drilling and fitting required for installation. Set work accurately in location, alignment and elevation, measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other work.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Comply with the following requirements for field welding:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Set loose items on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack open spaces with bedding mortar, consisting of 2 parts portland cement to 3 parts sand and only enough water for packing and hydration, or use commercial non-shrink grout material.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BOLLARDS

- A. Exterior: Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured. Fill bollards solidly with concrete mounding top surface to shed water.
- B. Interior: Bolt bollards to floor at locations indicated.

3.4 INSTALLING TRASH CAN ENCLOSURE

- A. Install steel trash can enclosure at location indicated on Site Plan. Permanently mount frame to concrete pad. Level and shim as required. Attach metal panels and trim after installation of steel frame.

3.5 ADJUSTING AND CLEANING

- A. Touch-up shop paint after installation. Immediately after erection, clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop. Use galvanizing repair paint on damaged galvanized surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces
 - 1. Clean field welds, bolted connections, and abraded areas and repair

galvanizing to comply with ASTM A 780.

2. Clean and prepare galvanized surfaces scheduled to be painted in accordance with the published recommendations of the American Galvanizers Association.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for wood blocking, nailers, plywood, back boards, miscellaneous wood support framing and other related work as indicated on the drawings.

1.2 REFERENCES

- A. Southern Pine Inspection Bureau (SPIB)
- B. APA The Engineered Wood Association
- C. American Softwood Lumber Standard PS 20, of the U.S. Department of Commerce
- D. American Wood Protection Association (AWPA)
- E. American Lumber Standard Committee (ALSC)

1.3 COORDINATION

- A. Fit carpentry work to other work. Scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.
- B. Coordinate blocking, shims, nailers and other rough carpentry work in contact with Architectural Woodwork items with the Architectural Woodwork installer/subcontractor.
- C. Coordinate the work of this Section with the work of other sections to ensure that blocking and framing is installed to support the required loads to be applied including but not limited to handrails, guard rails, and similar items indicating a loading requirement.

1.4 DELIVERY, STORAGE AND PROTECTION

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber and provide for air circulation within and around stacks and under temporary coverings.
- B. For lumber pressure treated with waterborne chemicals, place spacer between each bundle to provide air circulation.
- C. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under

coverings. Store panel products in accordance with (APA) recommendations.

1.5 SUBMITTALS

- A. Submit product data for each type of process and factory-fabricated or manufactured product. Indicate component materials and dimensions and include construction and application details.
- B. For each type of preservative-treated wood product, submit:
 - 1. wood treatment data including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing materials.
 - 2. certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards
 - 3. statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 - 4. warranty of chemical treatment manufacturer for each type of treatment.
- C. Submit research and evaluation reports for the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated wood
 - 2. Power-driven fasteners
 - 3. Powder-actuated fasteners
 - 4. Expansion anchors
 - 5. Metal framing anchors
- D. Submit qualifications of rough carpentry subcontractor/carpenter including training, experience record, references, and certifications.

1.6 QUALITY ASSURANCE

- A. Each piece of lumber shall be grademarked by an agency accredited by the American Lumber Standard Committee (ALSC), and manufactured in accordance with Product Standard PS 20 published by the U.S. Department of Commerce. Mark each piece of lumber to identify the type, grade, agency providing the inspection service, the producing mill and other qualities as specified herein.
- B. Rough carpentry subcontractor/carpenter shall have a minimum of five years experience in wood framing construction similar in size and scope to the work of this project.

C. Wood framing, including storage and handling, shall conform to the following published standards and recommendations unless indicated otherwise:

1. Engineered Wood Construction Guide, EWS (APA)
2. Wood Frame Construction Manual (SFPA)
3. National Design Specification for Wood Construction (NDS)

1.7 JOB CONDITIONS

A. Installer must examine all parts of the supporting structure and the conditions under which the framing work is to be installed, and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- C. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
- D. 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.
- E. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2 inch nominal thickness or less, unless otherwise indicated.
- F. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 LUMBER

- A. Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
 1. Blocking: Provide framing of Grade: No. 2, Species: Southern Yellow Pine; SPIB. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.3 BOARDS

- A. Where lumber less than 2 inches in nominal thickness and 2 inches or more in nominal width is shown or specified, provide boards complying with dry size requirements of PS 20.
- B. Concealed Boards: Where boards will be concealed by other work, provide the following:
 - 1. Moisture Content: 19 percent maximum, KD.
 - 2. Provide Southern Pine (SPIB) No. 1 boards.
 - 3. Concealed blocking at millwork and other built-in Architectural Woodwork items shall be approved by Architectural Woodwork supplier.

2.4 ANCHORAGE AND FASTENING

- A. Select proper type, size, material and finish of anchors or fastening devices for each required use.
 - 1. Nails, brads, and staples: ASTM F 1667
 - 2. Power driven fasteners: CABO NER-272
 - 3. Wood screws: ASME B18.6.1
 - 4. Screws for fastening wood sheathing to cold formed metal framing: Screws shall be equal to Grabber no.14 Bugle Head Self-drilling screws with minimum pull out of 283 pounds.
 - 5. Lag bolts: ASTM B18.2.1
 - 6. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6; with ASTM A 563 (ASTM A 563M) hex nuts and flat washers where indicated

2.5 TREATED WOOD

- A. Complete fabrication of treated items prior to treatment wherever possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- B. Where lumber or plywood is indicated as "Treated", or is specified herein to be treated, comply with the applicable requirements of the American Wood Protection Association (AWPA). Mark each treated item to comply with the AWP Quality Mark requirements for the specified requirements.
- C. Pressure-treat above-ground items with waterborne preservatives in accordance with AWPA Standard U1, Commodity Specification A, to the requirements of

Use Category 2 (UC2). After treatment, kiln-dry to a maximum moisture content of 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, blocking, stripping, shims, and similar members in connection with roofing, flashing, vapor barriers, waterproofing, and exterior wall and roof openings.
 2. Wood sills, sleepers, blocking, furring stripping, shims, and similar concealed members in contact with masonry or concrete.
- D. Fire-Retardant Treatment: Where "PR-S" lumber or plywood is shown or scheduled, comply with the AWPI Specification C-208 for pressure impregnation with fire-retardant chemicals to achieve a flame-spread rating of not more than 25 when tested in accordance with UL Test 723, ASTM E A4, or NFPA Test 355. Where treated items are indicated to receive a transparent or paint finish, use a fire-retardant treatment which will not bleed through or adversely affect bond of finish.
1. Provide Fire-Retardant Treatment at all wood in concealed rated plenum spaces and chases.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine all parts of the supporting structure and the conditions under which the carpentry work is to be installed and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- A. Use only sound, thoroughly seasoned materials of the longest practical lengths and sizes to minimize jointing. Use materials free from warp which cannot be easily corrected by anchoring and attachment. Sort out and discard warped material and material with other defects which would impair the quality of the work.
- B. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.
- C. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

3.3 ATTACHMENT AND ANCHORAGE

- A. Use common wire nails, except as otherwise shown or specified. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.

Make tight connections between members. Install fasteners without splitting of wood and predrill as required.

3.4 WOOD GROUND NAILERS, BLOCKING, AND SLEEPERS

- A. Provide wherever shown and where required for screeding or attachment of other work.
 - 1. Provide continuous treated wood blocking, secured to metal studs, for full height and width of openings in exterior walls and roofs including windows, doors, storefront, louvers, chases, and similar openings.
 - 2. Provide continuous wood blocking for toilet compartment partitions, urinal screens, grab bars and toilet accessories, light fixtures and other items to be secured to walls.
 - 3. Form to shapes as shown and cut as required for true line and level of work to be attached. Set true to line and level and plumb with intersections true to required angle.
 - 4. Coordinate location and placement with other work involved.
 - 5. Ensure that blocking is attached to substrate in a manner to support dynamic loads that may be applied to the device the blocking is to support.
- B. Attach to substrates securely with anchor bolts and other attachment devices as shown or as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Anchor items to built into masonry to formwork before concrete placement.
- C. Provide grounds of dressed, preservative treated, key-bevelled lumber not less than 1 1/2 inch wide and of the thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. The types of architectural woodwork in this Section include, but are not necessarily limited to the following:
 - 1. Cabinets and Special Fabrications
 - 2. Countertops
 - 3. Woodwork Hardware
 - 4. Miscellaneous work
- B. The extent of each type of architectural woodwork is shown on the drawings and in schedules. Architectural woodwork is defined to include, in addition to items so designated on the drawings, miscellaneous exposed wood members commonly known as "Finish Carpentry" or "Millwork," except where specified under another section of these specifications.

1.2 DEFINITIONS

- A. Terms used in this section are in accordance with terminology of the Architectural Woodwork Standards, Edition 1.

1.3 QUALITY ASSURANCE

- A. Comply with the provisions of Architectural Woodwork Standards, First Edition, 2009 as published by the Architectural Woodwork Institute (AWI), the Woodwork Institute (WI), and the Architectural Woodwork Manufacturers Association of Canada AWMAC.
 - 1. All construction, fabrications, finishes, and materials shall be in accordance with AWS Premium Grade Quality Standard as defined in this referenced publication.
- B. The millwork manufacturer shall:
 - 1. have a minimum of ten (10) years experience and shall have completed projects of similar scope and size to the work of this project.
 - 2. have technologically advanced woodworking facilities employing the use of modern equipment and techniques for fabrication and finishing to meet the level of quality for the manufacture of all fabrications specified.
 - 3. employ skilled workmen experienced in the fabrication and finishing of premium quality millwork.
 - 4. be a Manufacturing member of the Architectural Woodwork Institute.
 - 5. be responsible for fabrication, finishing and installation of all products and procedures specified in this Section.
- C. The Architect reserves the right to review and approve the flitch from which veneer will be chosen prior to fabrication of sheets to be used for constructing

paneling, doors, or cabinetry.

- D. For the following types of architectural woodwork, comply with the indicated standards as applicable.
 - 1. Lumber: AWS Section 3
 - 2. Interior Millwork: AWS Section 6
 - 3. Cabinetry: AWS Section 10
 - 4. Countertops: AWS Section 11

1.4 SUBMITTALS

- A. Submit shop drawings showing location of each item. Dimensioned plans and elevations shall be drawn at a minimum scale of $1/2" = 1'-0"$. Large scale details shall be drawn at a minimum scale of $3" = 1'-0"$. Shop drawings shall clearly indicate location of joints in panels, countertops, plastic laminates, brackets, hardware, metal finishes, attachment devices and other materials necessary for complete fabrication. Submit shop drawings for all work specified in this Section including but not limited to the following:
 - 1. Lumber
 - 2. Cabinets and Countertops
 - 3. Miscellaneous work
 - 4. Hardware and Accessory Materials
- B. Submit cabinet hardware and accessory product data and samples indicating conformance with the requirements of this Section.
- C. Submit manufacturer's qualifications including information on fabrication and finishing facilities as well as references and list of successfully completed projects of similar scope and size to the work of this project.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration. Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork has been completed in installation areas.
- B. If woodwork must be stored in other than installation areas due to unforeseen circumstances, store only in areas meeting requirements specified for installation areas.

1.6 JOB CONDITIONS

- A. The Installer shall advise the Contractor of temperature and humidity requirements for woodwork installation areas. Do not install woodwork until the required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. The Contractor shall maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of the optimum moisture content from the date of installation through the remainder of the construction period. The fabricator of the woodwork shall

determine the optimum moisture content and required temperature and humidity conditions.

1.7 COORDINATION

- A. Coordinate the work of this section with the work of other sections integral to fabrication of millwork to ensure proper fit, alignment, substrate conditions, attachment methods, adhesion and other conditions required for countertops and trims to be applied to millwork.
- B. Coordinate the work of this section with the work of other sections that require penetrations, attachments, or support mechanisms for architectural woodwork.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Provide kiln-dried lumber and maintain optimum moisture content from 8 to 13 percent range (damp region) in solid wood (hardwood and softwood) during fabrication, installation, and finishing operations of interior work.
- B. Provide plywood for concealed surfaces in accordance with AWS.
- C. Plastic Laminate shall comply with NEMA LD3 and shall be the type, thickness, color, pattern and finish as indicated for each application. Refer to Section 09050 - Color Design for selection of manufacturer, color and finish.
- D. Thermoset melamine resin impregnated paper where indicated shall be equal to Duramine. Refer to Section 09050 - Color Design for color.
- E. Comply with the details shown for profile and construction for architectural woodwork, and where not otherwise shown, comply with applicable AWS Quality standards with alternate details at fabricator's option.
- F. Fabricate architectural woodwork with pre-cut openings, wherever possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth the edges of cut outs and where located in countertops and similar exposures, seal the edges of cut outs with a water resistant coating.
- G. Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain measurements and verify dimensions and shop drawing details as required for accurate fit. Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication, without field measurements, and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

2.2 FINISH WOOD CLAD CABINETS

- A. Cabinets shall be wood veneer clad and fabricated in accordance with AWS for Premium Grade and as indicated on drawings. See Section 09050-Color Design for stain and finish selections. Wood veneer shall be book match horizontally for the full height of elevation. Each face panel in sequence shall be book matched horizontally and end matched vertically. Contiguous panels shall be from the same flitch. Veneer for millwork, doors and other contiguous and adjacent wood veneer construction shall be from same flitch. Sequence of edge/face lamination shall be edges then face so as to have no visible laminate edges on the face.

2.3 SOLID SURFACE COUNTERTOPS AND TRIMS

- A. Fabricate counter tops as detailed on drawings of 3/4 inch plywood. Provide 3/4 inch moisture resistant plywood at counter tops with sinks. Provide for tops, splashes and trims 1/2 inch thick solid surface polymer acrylic sheets constructed from cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting requirements of ANSI Z124.3 or ANSI Z124.6. Superficial damage to a depth of 0.010 inch shall be repairable by sanding and/or polishing. Exposed outside corners and edges shall have a 1/8 inch radius. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
1. Manufacturer: DuPont Corian, or equal
 2. See Section 09050, Color Design for color and finish selection.

2.4 SOLID SURFACE WINDOW SILLS

- A. Fabricate window sills as detailed on drawings of 1/2 inch solid surface polymer acrylic sheets constructed from cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting requirements of ANSI Z124.3 or ANSI Z124.6. Superficial damage to a depth of 0.010 inch shall be repairable by sanding and/or polishing. Exposed outside corners and edges shall have a 1/8 inch radius. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints
1. Manufacturer: DuPont Corian, or equal
 2. See Section 09050, Color Design for color and finish selection.

2.5 DRAWERS

- A. Fabricate drawers to approximate sizes and shapes indicated on the drawings.

2.6 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of these specifications. Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware." Unless shown or noted otherwise, cabinet hardware shall comply with the following:
1. Hinges: Concealed type equal to Blum Clip Top 120 degree, 71T5550 series with cover caps.
 2. Cabinet Pulls: Equal to Hafele, 124.02.921.Tab Collection Aluminum, matt silver anodized.
 3. Drawer guides shall be equal to Accuride:
 - a. For drawer face sizes up to 4 inches high and up to 16 inches wide provide model 2132, size as required by drawer depth, side mount, 75 pound rated, clear zinc finish.
 - b. For drawer face sizes greater than 4 inches high and up to 24 inches wide provide model 7432, size as required by drawer depth, side mount, 100 pound rated, clear zinc finish.
 - c. For drawer face sizes greater than 4 inches high and greater than 24 inches wide. Model 9301, size as required by drawer depth,

side mount, 150 - 500 pound rated, clear zinc finish.

4. Adjustable shelf hardware (side support) AWS Quality Standards, 5mm holes at 32mm on center upon approval of sample submitted. Shelf supports shall be equal to Knappe and Vogt 331 ANO.
5. Paneling and wall cabinet hangers: Equal to Kingclip as manufactured by Brooklyn Hardware, LLC.
6. Support bracket: Equal to Centerline Brackets, Forward-L, style brackets. Centerline Steel, LLC | 125 Douglas Park Drive, Ste. 5, St. Augustine, FL 32084. Tel: 888-960-3854. Web: centerlinebrackets.com Color shall be Black. Mount at a maximum spacing of 24 inches on center.
7. Linear Grommet: Equal to Doug Mockett, MAX1/C/M-94. Finish: Satin aluminum. Provide at location indicated.
8. Circular Grommets: Equal to Doug Mockett, Flip Top Series - 2 inch hole plastic grommet. Provide at locations indicated. Color to be selected from Manufacturer's full range.
9. Printer "wall" Grommet: Equal to Doug Mockett ZG Flip Top Series grommet. Provide at locations indicated. Color to be selected from Manufacturer's full range. Provide
10. Trash Grommet: Equal to Doug Mockett TM10B-SSS with satin chrome finish. Provide at location indicated.
11. Clothes hanging rod: Equal to Knappe and Vogt 0015 Heavy-Duty Closet Poles. 1 5/16 inch diameter with 1.5 mm walls. Provide 0010 Closet Pole Sockets. Finish shall be brushed nickel. Provide matching screws.

PART 3 EXECUTION

3.1 INSPECTION

- A. The Installer shall examine the substrates and conditions under which the work is to be installed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of the time substrates are to be built. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.3 INSTALLATION

- A. All work shall be installed in strict accordance with the Premium Grade Quality Standards in accordance with AWS.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for

plumb and level (including countertops); and with 1/16 inch maximum offsets in revealed adjoining surfaces. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

- C. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation and in accordance with AWS Premium Grade Quality Standards. Except where pre-finished matching fastener heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- D. Install cabinets without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
- E. Anchor countertops and vanity tops securely to base units and other support systems as indicated.
- F. Install grommets at locations indicated. Verify grommet locations for printer. Locate grommets at location to minimize run of cords from printer to computers and other devices located in adjacent room.
- G. Install countertop support brackets as indicated on drawings and shop drawings and in strict accordance with manufacturer's directions.
- H. Install doors plumb, level, and true and in strict accordance with AWS Premium Grade Quality Standards.

3.4 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean hardware, lubricate and make final adjustments for proper operation. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.
- C. Protection: The Installer of architectural woodwork shall advise the Contractor of final protection and maintenance conditions necessary to ensure that the work will be without damage or deterioration at the time of acceptance.

END OF SECTION

SECTION 06611

SOLID SURFACE SHOWER UNITS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes shower units fabricated from solid surface material in sizes as indicated on the Drawings.

1.2 SUBMITTALS

- A. Submit manufacturer's brochures, technical data, installation instructions, maintenance data, and operating instructions, including data substantiating that materials comply with requirements.
- B. Submit two sets of samples of each color and finish of exposed materials and accessories required for review and selection from manufacturer's full line.
- C. Submit shop drawings indicating all details for installation including connection to adjoining materials.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and protect shower systems in accordance with manufacturer's instructions and recommendations.

1.4 COORDINATION

- A. Coordinate the work of this section with related work specified in Section 09250 - Gypsum Drywall, Section 06100 - Rough Carpentry, Section 10800 - Toilet and Bath Accessories and Division 15 Mechanical.

1.5 QUALITY ASSURANCE

- A. Solid surface shower bases, solid surface wall panels, or other solid surface shower component material and fabrication shall be from one source.
- B. Full-size sample of shower receptor shall be tested and certified annually by an independent third-party laboratory for compliance with the harmonized CSA B45.5/IAPMO Z124 standard.
- C. Installer shall have installed similar systems and demonstrate a record of successful installations.
- D. Shower pan base shall conform the requirements of the ADA Standards for Accessible Design and ICC/ANSI A117.1–2003.
- E. Fire Test Data

1. Solid Surface materials shall be classified by Underwriters Laboratories under UL File Number R14436 for surface burning characteristics.
 2. Test data for Solid Surface panels shall be generated according to ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials. This procedure is catalogued by Underwriters Laboratories, Inc. as UL 723. For panels with a thickness of one-half inch (13 mm), the Flame Spread Index is less than or equal to 25 and the Smoke Developed Index is less than or equal to 25.
- F. Materials shall comply with the following Codes
1. Approved by NSF International Standard 51 "Splash Zone" areas.
 2. ASTM G-22 bacterial resistance.
 3. ASTM G-21 fungal resistance.

1.6 WARRANTY

- A. Furnish a manufacturer's Limited Ten-Year Commercial Warranty covering defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Meridian Solid Surface as manufactured by Tower Industries, Inc., 2101 Ninth St. SW, Massillon, OH 44647. Tel: 330-837-2216 Web: www.TowerShowers.com.
- B. Products of other manufacturers are acceptable upon conformance with the requirements of this section and approval by the architect.

2.2 MATERIALS

- A. Solid Surface Fabrications
1. Solid surface material shall be a homogeneous thermoset polymer compound comprised of acrylic and polyester components blended with pigments and/or mineral fillers and filled with alumina trihydrate. Materials shall be non-porous and homogenous, with uniform color and pattern throughout the entire thickness. Materials shall be 100 percent repairable.
 2. Solid surface material shall meet or exceed all performance requirements.

2.3 SHOWER UNITS

- A. Standard shower pans shall be manufactured from solid cast polyester/acrylic

blend resin and have fixed drain locations, coved side walls, radius transitions at curbs and thresholds, a minimum 1 inch wide panel platform with a minimum 5 degree slope and a 1 inch minimum water dam.

- B. Standard shower pans shall be manufactured as a one-piece, seamless, modular unit with no joints in the shower floors, curbs, or thresholds.
- C. Shower pans shall be comprised entirely of solid surface material with no voids or filler materials at underside of pan.
- D. Shower pans shall have a pebble-textured, non-skid floor pitched toward the drain at a minimum 0.6 degree slope (1/8 inch per foot).
- E. Shower pans shall have a non-slip co-efficient rating of .30 or greater as registered by the ASTM F462 slip resistance test method.
- F. Shower Pans shall be a minimum of 9/16 inch thick at the thinnest point of the drain orifice.
- G. Shower wall panels shall be manufactured from solid cast polyester/acrylic blend resin.
 - 1. Wall thickness shall be 1/4 inch.
 - 2. Shower wall panels measuring 61 inches or less in width shall be supplied as single panels with no joints.
 - 3. Shower wall panels shall be manufactured and supplied at largest practical sizes so as to minimize seaming at the jobsite.
 - 4. Shower wall panels shall be trimmed and scribed at time of installation to ensure proper fit.
 - 5. Provide matching wall panels for other wall installations indicated on drawings.
- H. Shower Trim Moldings
 - 1. Shower trim moldings shall be manufactured from solid cast polyester/acrylic blend resin.
 - a. Batten Strips: 2 inches wide x 1/4 inch thick x lengths as shown on drawings.
 - b. Inside Corner Molding, Chamfered, 1 inch wide x 1/2 inch thick x lengths as shown on drawings.
 - c. CornerSeal Inside Corner Molding, 1 inch x 1 inch x lengths as shown on drawings.
 - 1) Inside Corner Molding shall be installed using Solid

Surface Molding Adhesive supplied by Manufacturer.

- d. Outside Corner Molding, Miter-Folded, 1 inch x 1 inch x lengths as shown on drawings.
- e. Shower trim moldings shall be supplied loose for trimming and scribing at time of installation.

I. Shower Accessories

- 1. Shower accessories shall be manufactured from solid cast polyester/acrylic blend resin.
 - a. Recessed Soap & Shampoo Holder, Model MSARSS

PART 3 EXECUTION

3.1 PREPARATION AND COORDINATION

- A. Verify and provide all plumbing drains outlets required for proper operation prior to rough-in. Coordinate with Plumbing subcontractors.

3.2 EXAMINATION

- A. Examine all substrates to receive solid surfacing for compliance with installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Remove shipping packaging and install components in strict accordance with manufacturer's instructions.
- B. Install units in strict accordance with manufacturer's installation instructions.
- C. Install products plumb and level in locations indicated, using manufacturer's recommended installation adhesives and materials, and in accordance with manufacturer's recommended installation procedures. Securely attach to supporting structure.
 - 1. Trim and scribe all shower wall panels and shower trim moldings to ensure proper fit.
 - 2. Form field joints at wall panels (where required) using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - 3. Cut and finish component edges with clean, sharp returns.
 - 4. Trim molding shall be installed using a continuous bead of Solid Surface

Molding Adhesive as provided by Solid Surface Shower Unit Manufacturer.

3.4 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove all adhesives and sealants from the product surfaces in accordance with Solid Surface Shower Unit Manufacturer's instructions.
- C. After installation is complete, remove all excess adhesive, dirt and debris from the installation area. Clean surfaces in accordance with Solid Surface Shower Unit Manufacturer's instructions.
- D. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 07190

VAPOR BARRIER

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes vapor barrier for slab on grade.

1.2 SUBMITTALS

- A. Submit:
 - 1. Manufacturers technical product data for each type vapor barrier
 - 2. Vapor barrier accessories
 - 3. Vapor barrier system installation instructions including sealing tape, flashing tape, boots, flashing sheets, and related items.
 - 4. Vapor barrier and accessory product samples.
- B. Submit either test reports or manufacturer's certificates indicating materials comply with specified requirements.
- C. Submit installers qualifications including list of similar projects.

1.3 QUALITY ASSURANCE

- A. Installer shall be thoroughly familiar with the installation of vapor barriers specified in this Section and shall have completed a minimum of 5 similar installations.

1.4 REFERENCED STANDARDS

- A. ASTM E1745 - 09 Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- B. D1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- C. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.
- D. F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

PART 2 PRODUCTS

2.1 VAPOR BARRIER AT GRADE

- A. Manufacturer: Fortifiber Building Systems Group, 300 Industrial Drive, Fernley,

1. Underslab Membrane shall be equal to Moistop Ultra 15
 - a. Material: Polyolefin film
 - b. Thickness: 15 mils
 - c. Roll Size: 14 feet wide by 140 feet long
- B. Membrane shall be tested in accordance with ASTM meeting the following requirements:
 1. Water Vapor Permeance: less than .02 perms, ASTM F-1249/ASTM E-96.
 2. Tensile Strength: 70 foot pounds per inch-MD, 70 foot pounds per inch-CD, in accordance with ASTM E-154, Section 9, Test Method D-822
 3. Puncture Resistance: 3000 grams in accordance with ASTM D-1709

2.2 ACCESSORIES

- A. Joint sealing tape for vapor barrier at grade shall be equal to Fortfiber Moistop tape.
 1. Width: 4 inches
 2. Thickness: 8 mils
 3. Adhesive: Synthetic Rubber
 4. Backing: Polyethylene
 5. Peel Adhesion (stainless steel): 20 oz./inch
 6. Tensile Strength: 22 lbs./inch
 7. Elongation: 90%
- B. Penetration seals for vapor barrier at grade shall be equal to Fortifiber "Boots", pre-sized, multi-purpose penetration seal manufactured from puncture resistant polyolefin membrane
- C. Joint sealing tapes, flashing, and related materials for window and door wall penetrations shall be as recommended by the wall barrier manufacturer for a complete wall vapor barrier system.
 1. Provide FortiSeal or equal high strength, high stretch polyolefin penetration seals with pre punched holes in sizes as required for penetrations.

- a. Size: 6 inches x 6 inches
 - b. Thickness: 10 mils
- D. Sealant shall be as specified in Section 07900 - Caulking and Sealants.

PART 3 EXECUTION

3.1 VAPOR BARRIER AT GRADE

- A. Install membrane and accessories in strict accordance with manufacturer's directions and recommendations and as indicated on the drawings.
 - 1. The membrane shall be unrolled over the thoroughly compacted subgrade and turned down at the inside perimeter of grade beams. Joints shall be sealed, watertight, with a pressure sensitive tape or cement recommended by the manufacturer, allowing a minimum overlap of 6 inches. Where pipes and conduits pass through the membrane, provide pre-manufactured sleeves to fit pipe size, double the membrane thickness, and seal as specified for joints. Inspect the membrane thoroughly and repair all punctures immediately before placing concrete. Equipment, tools, and procedures that might puncture the membrane shall not be used while placing and finishing the concrete.

3.2 PROTECTION

- A. Protect vapor barrier from damage during successive phases of work. Completely replace damaged pieces or sections. Patch tears with similar material properly overlapped and sealed to insure integrity of membrane.

3.3 CLEANING

- A. Inspect vapor barrier membrane thoroughly and keep clean. Remove any dirt, oils, mud, debris, etc. prior to proceeding with next phase of work.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the building insulation as shown on the drawings and specified in this section.

1.2 SUBMITTALS

- A. Submit manufacturer's product data, technical information, material safety data sheets, test reports and installation instructions for each type of insulation and accessory.
- B. Submit shop drawings showing location of insulations, extent of work, material used and method of fastening.
- C. Submit 12 inch X 12 inch samples of each type of insulation.
- D. Submit sample of each type of adhesive and fastener.

1.3 QUALITY ASSURANCE

- A. Obtain each type of insulation from one source.
- B. Installers shall be experienced in the installation of each type of insulation.

1.4 PRODUCT HANDLING

- A. Store all products in dry areas inside and in accordance with manufacturer's printed instructions and recommendations.
- B. Use all means necessary to protect the materials of this section from physical damage and from deterioration due to moisture, soiling and other sources.

PART 2 PRODUCTS

2.1 BATT INSULATION

- A. Provide products equal to Owens Corning
 - 1. Batt Insulation at Walls: Provide thermal insulation conforming to ASTM C 665, Type I , un-faced. Thickness of insulation shall be full thickness of stud cavity or as indicated on the drawings. Width of batts shall be as required to be friction fit between framing members.
 - 2. Sound Control Insulation, Interior Partitions: Provide QuietZone Acoustic

Batts, unfaced sound attenuation batt insulation conforming to ASTM C 553, Type I, and ASTM C 665, Type I. Batts shall have surface burning characteristics of (10) for maximum flame spread and (10) for maximum smoke developed when tested in accordance with ASTM E 84. Batts shall be noncombustible when tested in accordance with ASTM E 136. Thickness of insulation shall be full thickness of stud cavity or as indicated on drawings.

3. Sound Control Insulation, Above Lay-in Ceilings: Provide QuietZone Acoustic Batts, unfaced sound attenuation batt insulation conforming to ASTM C 553, Type I, and ASTM C 665, Type I. Batts shall have surface burning characteristics of (10) for maximum flame spread and (10) for maximum smoke developed when tested in accordance with ASTM E 84. Batts shall be noncombustible when tested in accordance with ASTM E 136. Thickness of insulation shall be six inches.

2.2 RIGID INSULATION

- A. Provide rigid insulation equal to Thermax ci as manufactured by Dow Chemical Company. Thickness shall be 5/8 inch thick. Provide multiple layers or thicker insulation sheets where indicated.

2.3 FLUTE FILLER INSULATION

- A. Provide flute filler insulation between roof deck flutes where indicated or where required to provide a continuous barrier between outside and inside of building at soffits and similar locations. Flute filler insulation shall be equal to Foam-Control Plus as manufactured by ACH Foam Technologies.

2.4 ACCESSORIES

- A. Provide all accessories as necessary to properly install insulation products and to conform with the required ratings specified.
- B. Adhesives or cements for installing insulation shall be water-resistant types as recommended by the insulation manufacturer for each of the various uses and locations. Use fire-resistive adhesives.
- C. Fasteners and other metal devices required for installing insulation shall be as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where building insulation is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions for the particular condition of installation in each case. If printed instructions are not available, or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions filling voids with insulation, including headers and jams . Remove projections which interfere with placement.
- C. Apply a single layer of insulation to the required thickness, unless a double layer is required or indicated, to make up the total thickness shown.
- D. Tape joints and ruptures in vapor barriers, using tape specified above, and seal each continuous area of insulation to surrounding construction so as to ensure vapor tight installation of the units.
- E. Adhesive Application - per manufacturer's printed directions. Apply adhesive over entire back of insulation and on edges of insulation, except as noted below.
- F. Fastener Installation - per manufacturer's printed directions. Install fasteners 12 inches o.c. each way. Use adhesive as specified herein per fastener manufacturer's recommendations.
- G. Install blanket fiberglass insulation with edges closely butted. Cut and fit insulation to closely fit intersecting or penetrating surfaces.
- H. Where insulation is installed above ceilings, install tight fit to completely fill the space. Do not install insulation within 3 inches of light fixtures, unless fixtures are approved for use with insulation. Secure insulation within specified distance around light fixtures to prevent accidental movement.
- I. Install flute filler insulation at metal deck flutes at overhangs, soffits, and similar locations as required to completely insulate exterior walls of the building.

3.3 CLEAN UP

- A. Properly clean up all materials and debris, sealants, etc. and leave project area in an acceptable condition.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. The work of this section includes, but is not limited to, the following:
1. Materials and installation methods for fluid applied vapor permeable air and vapor barrier membrane system located in the non-accessible part of the wall.
 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.
 3. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

1.2 PERFORMANCE REQUIREMENTS

- A. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 inch water (1.57 psf) when tested according to ASTM E 2178.
- B. Assembly Performance: Provide a continuous air and vapor barrier assembly that has an air leakage not to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.3 inch water (1.57 psf) when tested in accordance with ASTM E 2357, and a vapor permeance of 1 perm or less when tested in accordance with ASTM E 96 using the desiccant method. Assembly shall perform as a liquid drainage plane flashed to discharge condensation or water penetration to the exterior. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.
1. Assembly shall be capable of withstanding combined positive and negative design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
 2. Assembly shall not displace adjacent materials under full load.
 3. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated seismic movement.

- C. Connections to Adjacent Materials: Provide connections to prevent air leakage and vapor migration at the following locations:
1. Foundation and walls, including penetrations, ties and anchors.
 2. Walls, windows, curtain walls, storefronts, louvers or doors.
 3. Different wall assemblies, and fixed openings within those assemblies.
 4. Wall and roof connections and penetrations.
 5. Floors over unconditioned space.
 6. Walls, floor and roof across construction, control and expansion joints.
 7. Walls, floors and roof to utility, pipe and duct penetrations.
 8. Expansion joints.
 9. All other leakage pathways in the building envelope.

1.3 SUBMITTALS

- A. Submit manufacturer's product data, installation instructions, use limitations and substrate preparation recommendations. Submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years
- B. Submit shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
- C. Submit shop drawings showing locations and extent of air and vapor barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the air and vapor barrier are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.
- D. Submit written documentation demonstrating installers qualifications including experience, training, and referenced projects of a similar size and scope.
- E. Submit representative samples of the following for approval:
1. Fluid applied air barrier membrane
 2. Transition membrane
 3. Through wall flashing

- F. Submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of manufacturer and certification number of installers.
- G. Submit a sample warranty identifying the terms and conditions

1.4 QUALITY ASSURANCE

- A. Air and vapor barrier systems shall be manufactured by a firm with experience in the production of waterproofing and air barrier products.
- B. The installer shall have complete a minimum of 3 projects of similar scope and complexity within the past 5 years and must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner. The installer shall be accredited by the Air Barrier Association of America (ABAA) whose applicators are certified in accordance with the ABAA Quality Assurance Program.
- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
 - 1. Review of submittals.
 - 2. Review of surface preparation, minimum curing period and installation procedures.
 - 3. Review of special details and flashings.
 - 4. Sequence of construction, responsibilities and schedule for subsequent operations.
 - 5. Review of mock-up requirements.
 - 6. Review of inspection, testing, protection and repair procedures.
- D. Mock-up:
 - 1. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be provided to verify details and tie-ins and to demonstrate the required quality of materials and installation.
 - 2. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (roof, foundation, etc).
 - 3. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.
 - 4. Mock-up may remain as part of the work.

5. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied membrane components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.6 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

1.7 WARRANTY

- A. Material Warranty: Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.
- B. Installation Warranty: Provide air barrier subcontractor's 2 year warranty from date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Fluid applied membrane air barrier shall as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA.
- B. Fluid applied vapor barriers by other manufacturers equal in quality and performance may be acceptable upon submission of data substantiating compliance with the requirements of this Section and approval by the Architect.

2.2 FLUID-APPLIED AIR BARRIER MEMBRANE

- A. Perm-A-Barrier VPL, fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when

applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall meet the following requirements:

1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa).
2. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
3. Water Vapor Permeance: ASTM E96, Method B: Greater than 10 perms.
4. Pull Adhesion: ASTM D4541: minimum 20 psi or substrate failure to glass faced wall board, minimum 100 psi to concrete/CMU.
5. Low temperature flexibility: ASTM D1970: Pass at minus 20 degrees Fahrenheit (at minus 29 degrees Celsius).
6. Water resistance of in-place membrane: ASTM E331: Pass. No water penetration after 90 minutes @ 299 Pa (6.24 psf) tested over OSB and gypsum sheathing.
7. Nail sealability: ASTM D1970: Pass UV Exposure Limit: Equal to or greater than 180 calendar days.
8. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 ADHESIVE MEMBRANE FLASHING

A. Transition membrane shall be equal to Perm-A-Barrier Detail Membrane

1. Provide a 36 mil thick self-adhesive rubberized asphalt integrally bonded to 4 mil of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
2. Performance Requirements:
 - a. Water Vapor Transmission: ASTM E 96, Method B: (0.05 perms) max.
 - b. Air Permeance (0.3 inch water) pressure difference: (0.00012 cfm/ft²) max.
 - c. Puncture Resistance: ASTM E 154: (40 pounds) min.
 - d. Lap Adhesion at (25 degrees F), ASTM D 1876: (5.0

pounds/inch) of width min.

- e. Low Temperature Flexibility, ASTM D 1970: Unaffected to (-45 degrees F).
- f. Tensile Strength, ASTM D 412, Die C Modified: minimum (400 psi)
- g. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: minimum 200 percent

B. Membrane wall flashing and through wall flashing shall be equal to Perm-A-Barrier Wall Flashing.

- 1. Provide a 32 mils self-adhesive rubberized asphalt integrally bonded to a 8 mil cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- 2. Performance Requirements:
 - a. Water Vapor Transmission, ASTM E 96, Method B: (0.05 perms) maximum
 - b. Water Absorption, ASTM D 570: max. 0.1 percent by weight
 - c. Puncture Resistance, ASTM E 154: (80 pounds) minimum
 - d. Tear Resistance
 - 1) Initiation ASTM D 1004: minimum (13.0 pounds) M.D.
 - 2) Propagation ASTM D 1938: minimum (9.0 pounds) M.D.
 - e. Lap Adhesion at (25°F), ASTM D 1876: (5.0 pounds/inch) of width
 - f. Low Temperature Flexibility, ASTM D 1970: Unaffected to (-45 degrees F)
 - g. Tensile Strength, ASTM D 412, Die C Modified: minimum (800 psi)
 - h. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: minimum 200 percent

2.4 AIR BARRIER ACCESSORIES

- A. Primer shall be a water-based primer which imparts an aggressive, high tack finish on the treated substrate equal to Perm-A-Barrier WB Primer.

1. Flash Point: No flash to boiling point
 2. Solvent Type: Water
 3. VOC Content: Not to exceed 10 g/l
 4. Application Temperature: -4 degrees C (25 degrees F) and above
 5. Freezing point (as packaged): -7 degrees C (21 degrees F)
- B. Two part, elastomeric, trowel grade material shall be designed for use with self-adhered membranes and tapes with a VOC content of 10 g/l maximum, equal to Bituthene Liquid Membrane.
- C. Other materials as may be required for a complete air barrier system.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied waterproofing.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with (2-3 inch) wide, reinforced self-adhesive tape or fiberglass mesh style wallboard tape. Gaps greater than (1/4 inch) shall be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied membrane.
- C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth flush mortar joints. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
- D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

3.3 INSTALLATION

- A. Install in strict accordance with manufacturer's recommendations and installation

instructions.

B. Application of Fluid Applied Membrane

1. Spray or trowel apply a continuous uniform film at minimum 60 mils dry film thickness using multiple, overlapping passes.
2. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
3. When spraying use high pressure, multi-component, airless spray equipment approved by material manufacturer.
4. Carry membrane into any openings a minimum of 2 inches.
5. Seal all brick-ties and other penetrations as work progresses.

C. Application of Transition Membrane

1. After allowing the fluid applied membrane to cure to tack-free, apply transition membrane with a minimum overlap of 3 inches onto each surface at all beams, columns and joints as indicated in detail drawings.
2. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
3. Use pre-cut, easily handled lengths for each location.
4. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
5. When properly positioned, place against surface by pressing firmly into place by hand roller.
6. Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
7. Seal top edge of flashing with termination mastic.
8. When transition flashing is pre-installed prior to application of fluid applied membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of fluid membrane at minimum 60 mils dry film thickness using multiple, overlapping passes, with a minimum overlap of 3 inches onto transition flashing. For sill condition, spray or trowel fluid membrane onto pre-installed sill flashing and onto horizontal section of sill.

D. Application of Flexible Membrane Wall Flashing

1. Precut pieces of flashing to easily handled lengths for each location.
2. Remove silicone-coated release paper and position flashing carefully

before placing it against the surface.

3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
4. Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
5. Trim bottom edge 1/2 inch back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations, turn up ends a minimum of 2 inches and make careful folds to form an end dam, with the seams sealed.
7. Seal top edge of flashing with termination mastic.
8. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.4 CLEANING AND PROTECTING

- A. Excess materials shall be removed from the job site.
- B. All surrounding areas, where materials have been installed, shall be left free of debris and foreign substances resulting from the work.
- C. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
- D. Schedule work to ensure that the fluid applied air and vapor barrier membrane system is covered as soon as possible after installation. Protect fluid applied air and vapor barrier membrane system from damage during subsequent operations. If the system cannot be covered within 60 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items.
 - 1. Walls and partitions.
 - 2. Smoke barriers: See Section 07900 - Joint Sealants for smoke partitions that do not require a fire rating.
 - 3. Construction enclosing compartmentalized areas.
- B. Provide all labor, material, equipment and services required for complete installation of all firestopping as indicated on the drawings, specified herein, and/or required for completion of the work.
- C. Firestopping shall be required at rated fire and smoke "fire barrier" walls. Openings for air-handling ductwork or air movement, pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts and similar building service equipment that pass through or penetrate in any way a rated fire or smoke "fire barrier" wall or floor shall be protected.

1.2 REFERENCES

- A. Underwriters Laboratories (UL) of Northbrook, IL "Fire Resistance Directory".
 - 1. Through Penetration Firestop Systems (XHEZ)
 - 2. Joint Systems (XHBN)
 - 3. Fill, Void or Cavity Materials (XHHW)
 - 4. Firestop Devices (XHJI)
 - 5. Forming Materials (XHKU)
 - 6. Wall Opening Protective Materials (CLIV)
- B. Building codes:
 - 1. Uniform Building Code published by ICBO
 - 2. Standard Building Code published by SBCCI.
 - 3. National Building Code published by BOCA.
 - 4. International Building Code published by ICC.

- C. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 101: Life Safety Code".
- D. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 70: National Electrical Code".

1.3 QUALITY ASSURANCE

- A. Provide all products from one manufacturer with minimum of 5 years experience specializing in the manufacture of firestopping materials.
- B. Penetrations and miscellaneous openings in rated fire and smoke "fire barrier" walls shall be protected in accordance with NFPA 101, Life Safety Code, Chapter 6, Features of Fire Protection.
- C. All firestopping materials used shall conform to ASTM E814, ASTM E119, and UL 1479 and tested in accordance with NFPA 90A and NFPA 251 as part of a rated assembly.
- D. Installation contractor shall have a minimum of 5 years experience in the installation of firestopping products and systems and shall be certified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products in accordance with specified requirements.
- E. Systems shall be based on Underwriters Laboratories (U.L.) systems and tests and shall be designed in accordance with U.L. fire resistance ratings. Contractor shall comply with the applicable U.L. requirements for fire and smoke partitions and assemblies shown on the drawings.
- F. Materials not conforming to these firestopping specifications shall not be used. Materials such as gypsum wallboard mud, caulking and sealants that are not U.L. rated and approved will not be allowed.
- G. Conduct a preinstallation conference to review locations of firestopping systems and relationship to other work of the project.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
- B. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
- C. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

- D. Openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
- E. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
- F. Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.
- G. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E-1399, ASTM E-1966 or ANSI/ UL 2079.
- H. Provide fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL2079 with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.

1.5 SUBMITTALS

- A. Submit manufacturer's product data, specifications, installation procedures and material safety data sheets for each type of firestopping and accessory required.
- B. Submit experience record of firestopping installer including list of successfully completed projects of similar size and scope of the work of this project. Submit manufacturer's certification stating that installer is certified and trained to install specified products.
- C. Submit shop drawings indicating locations of each area where firestopping is required. Shop drawings shall indicate each through-penetration firestop system, each location, kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency that evidences compliance with requirements for each condition indicated.
- D. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- E. Submit product certificates signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

- F. Submit product test reports from a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products and systems.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged materials in manufacturer's original unopened containers and store in weathertight enclosure. Handle and store all materials as required to prevent inclusion of foreign materials, breakage or damage and in accordance with manufacturer's instructions.
- B. Do not use damaged or expired materials.

1.7 WORKMANSHIP

- A. Materials and workmanship not conforming to provisions of the specifications and manufacturer's printed instructions shall be rejected at any time during the course of the work. Rejected materials shall be removed from the site at the time of rejection. Rejected workmanship shall be corrected immediately after rejection.

1.8 PROJECT CONDITIONS

- A. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Architect has examined each installation.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Provide firestopping products that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as

demonstrated by firestopping products manufacturer based on testing and field experience.

- B. Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

- A. Manufacturers shall be listed in the UL Fire Resistance Directory-Volume 2. Provide products of Specified Technologies, Inc. (STI), Somerville, New Jersey, Telephone: 1-800-992-1180 or approved equal.

2.3 MATERIALS

- A. General: Use only firestopping products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type or joint opening width and movement capabilities, annular space requirements, and fire-rating involved for each separate instance.
- B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant
 - 2. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant
 - 3. Specified Technologies, Inc. (STI) SpecSeal Series LC Endothermic Sealant
 - 4. Specified Technologies, Inc. (STI) SpecSeal Series AS200 Elastomeric Spray
 - 5. Specified Technologies, Inc. (STI) SpecSeal Series ES Elastomeric Sealant
- C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
 - 2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars
- D. Wall Opening Protective Materials: Intumescent, non-curing pads or inserts for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24 inches, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty Pads
 2. Specified Technologies, Inc. (STI) SpecSeal Series EP PowerShield Insert Pads
- E. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty
- F. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series RED Wrap Strip
 2. Specified Technologies, Inc. (STI) SpecSeal Series BLU Wrap Strip
- G. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSB Firestop Pillows
- H. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSM Firestop Mortar
- I. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:
1. Specified Technologies, Inc. (STI) Pensil 300 Silicone Sealant
 2. Specified Technologies, Inc. (STI) Pensil 300 SL Self-Leveling Silicone Sealant
- J. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam, the following products are acceptable:
1. Specified Technologies, Inc. (STI) Pensil 200 Silicone Foam

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for

opening configurations, penetrating items, substrates, and other conditions affecting performance. Report any conditions detrimental to the performance of firestopping materials and systems to the contractor.

- B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
- C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- D. Do not proceed with installation until after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Installation of firestopping materials shall be in accordance with manufacturer's printed instructions.
 - 1. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.
 - 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of through-penetration firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 3. Protect materials from damage on surfaces subjected to traffic.
 - 4. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition might occur such as the intersection of a gypsum wallboard/steel stud wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.
 - 5. Where joint application is exposed to the elements, fire-resistive joint sealant must be approved by manufacturer for use in exterior applications and shall comply with ASTM C-920, "Specification for Elastomeric Joint Sealants".
- B. Verify application required and location for each type of firestopping to be used and conform to manufacturer's exact instructions for specific applications.
- C. After installation of all work, including but not limited to ductwork, fire and smoke dampers, communication cabling, electrical conduit, etc., properly seal all openings, cracks, crevices and penetrations throughout the entire project, to maintain fire ratings shown.
- D. Install fireproof sealant at all penetrations through rated walls and floors and at top and bottom on each side of rated walls.
- E. Install fire protection board in strict accordance with manufacturer's

requirements to maintain fire ratings shown.

- F. Install approved metal sleeves with fireproof sealant at all new and existing communication and control wiring passing through rated walls throughout the entire project.

3.3 FIELD QUALITY CONTROL

- A. Keep areas of work accessible until inspection by authorities having jurisdiction.
- B. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.4 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for preformed metal siding and soffit panels and related products.
- B. The type of preformed metal siding and soffit includes, but are not limited to, the following:
 - 1. Preformed, prefinished metal siding.
 - 2. Miscellaneous trim, flashing, closures, drip flashing and accessories.
 - 3. Sealant.
 - 4. Fastening devices.

1.2 REFERENCES

- A. ASTM - American Society for Testing and Materials
- B. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc. , Architectural Sheet Metal Manual

1.3 SYSTEM DESCRIPTION

- A. The system includes preformed sheet metal panels, related accessories, inside and outside corners, miscellaneous trim, flashing and attaching devices.

1.4 SUBMITTALS

- A. Submit manufacturer's product data on all products specified.
- B. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of terminations and connections of metal work. Indicate all framing, blocking and other related and adjacent work.
- C. Submit a two foot by full width sample of each type, size, and shape of panel indicating factory finish.
- D. Submit results indicating system compliance with minimum requirements of the following performance tests:
 - 1. Water Infiltration - ASTM E 331-86

- E. Submit calculations verifying metal siding and attachment method resists wind pressures imposed on it pursuant to applicable building codes.
- F. Submit qualifications of panel installer including references.

1.5 QUALITY ASSURANCE

- A. The Manufacturer shall have ten (10) years minimum experience specializing in the manufacture of sheet metal products similar in size and scope of the work of this project.
- B. The Installer/Subcontractor shall have a minimum of 10 years experience in the installation of products similar in size and scope of the work of this project.
- C. Mock-up:
 - 1. Install a job mock-up using approved products and installation methods. Obtain Architect's acceptance of mock-up prior to starting work.
 - 2. Mock-up size shall be adequate to determine characteristics of installed system and shall include horizontal and vertical joints, inside and outside corner, soffit, and other shapes and profiles representative of the installed system.
 - 3. Maintain mock-up during construction for workmanship comparison. Mockup may be incorporated into the work upon approval.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with manufacturer's recommendations.
- B. Panels shall be stored on edge in a clean dry place. One end shall be elevated to allow moisture to run off. Panels with strippable film shall not be stored in the open exposed to the sun. Stack all materials to prevent damage and to allow for adequate ventilation.

1.7 WARRANTY

- A. Applicator shall furnish guarantee covering watertightness of the system for the period of one (1) year from the date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Products shall be manufactured by Berridge Manufacturing Company, Houston, Texas or approved equal.

2.2 SYSTEM

- A. Work in this section is based on Berridge Smooth FW-12 series flat wall panel system, without grooves, 12 inch wide panel coverage, 1 1/2 inches deep.

2.3 SHEET MATERIALS

- A. Unfinished Metal shall be ASTM A446-85 Grade C G90 Coating ASTM 525-86 Hot Dipped Galvanized, Galvalume ASTM 792-86, Grade 40 or Pre-Weathered Galvalume.
- B. Prefinished Metal shall be Hot-Dipped - ASTM A446-85 Grade C Coating A525-86, minimum 24 gauge core steel or prefinished Galvalume ASTM 792-86 Grade 40.
- C. All exposed flashing and sheet metal shall be galvalume.
- D. Strippable film shall be liquid applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film shall be removed before installation.

2.4 ACCESSORY MATERIALS

- A. Sub-Girts: 16 gauge thick steel, hat profile; to attach to panel system and building structure. Provide additional framing as required to comply with wind resistance requirements.
- B. Internal and Exterior corners: Same material, thickness and finish as exterior sheets.
- C. Trim, closure pieces and other items: Same material, thickness and finish as exterior sheets., brake formed to required profiles.
- D. Fasteners: (Galvanized Steel) with washers where required.
- E. Sealant: As specified in Section 07900.
- F. Related flashing products: See Section 07600 - Flashing and Sheet Metal
- G. Concealed anchor clips to be spaced as required to meet uplift and wind loads.

PART 3 EXECUTION

3.1 INSPECTION

- A. Substrate: Examine structure to ensure proper attachment to framing. Inspect structure to verify it is clean and smooth, free of deflections, waves or projections, properly installed to receive system.

3.2 INSTALLATION

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
- B. Install panels in such a manner that horizontal lines are true and level and

vertical lines are plumb.

- C. Install starter and edge trim before installing roof panels.
- D. Remove protective strippable film prior to installation of roof panels.
- E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- F. Install sealants for preformed metal panels as specified on shop drawings.
- G. Do not allow panels or trim to come into contact with dissimilar materials.
- H. Do not damage completed roof. If required, provide cushioned walk boards.
- I. Protect installed panels and trim from damage caused by adjacent construction until completion of installation.
- J. Remove and replace any panels or components which are damaged beyond successful repair.

3.3 CLEANING

- A. Clean any grease, finger marks, or stains from the panels in accordance with manufacturer's recommendations. Remove all scrap and construction debris from the site.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section included requirements for modified bituminous membrane roofing, roof insulation, and related materials. The extent of roofing system work is indicated on the drawings.
- B. Furnish and install Modified Bitumen Roofing System, including:
 - 1. Roofing manufacturer's requirements for the specified warranty.
 - 2. Preparation of roofing substrates.
 - 3. Insulation.
 - 4. Modified Bitumen roofing membranes.
 - 5. Metal roof edging and copings.
 - 6. Flashings.
 - 7. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.
 - 8. Walkway Pads

1.2 SUBMITTALS

- A. Product Data:
 - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
 - 2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
 - 3. Provide manufacturer's installation instructions indicating exactly how all components will be installed.
 - 4. Samples: Submit samples of each product to be used.
 - 5. Shop Drawings:

- a. Submit shop drawings indicating entire roof area plan and details of all perimeter conditions, penetrations, drains, flashing, base tie-ins, walkway pads, vents, fascias, roof edges, terminations, expansion joints, parapets and other conditions at the roof area. Shop drawings shall also comply with the requirements of the manufacturer for warranty of roof system.
 - b. Submit insulation project-specific layout and dimensions for each board.
- B. Submit specimen warranty prior to starting work.
- C. Submit installer qualifications to include:
 - 1. Letter from manufacturer designating roofing contractor as an approved installer of the work of this Section.
 - 2. List of successfully completed projects similar in size, scope, and complexity to the work of this project.
- D. Submit roofing contractors experience record including list of similar projects.

1.3 QUALITY ASSURANCE

- A. The roofing manufacturer shall have a minimum of 10 years experience in the production of membranes and accessories specified in this section.
- B. Roofing system and components shall be supplied and warranted by the approved roofing system manufacturer/installer as a total roofing system.
- C. The roofing contractor shall have a minimum of 5 years experience in the installation of products specified in this section and shall have successfully completed roof work of similar size and scope of the work of this project.
- D. Installer shall have certification from manufacturer of roofing system stating that the installer is approved by manufacturer for installation of specified roofing system.
- E. Provide roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
- F. Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.
- G. Comply with Underwriters Laboratories, Inc. (UL) Class A assembly, Factory Mutual Global (FMG) I-90 wind uplift requirements, and FMG Loss Prevention Data Sheets 1-28 and 1-29.

1.4 PRE INSTALLATION CONFERENCE

- A. Approximately two weeks prior to scheduled commencement of roofing

installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work, including (where applicable) Owner's insurers, test agencies, and governing authorities.

- B. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:
 - 1. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
 - 2. Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.
 - 3. Review roofing system requirements (drawings, specifications, and other contract documents).
 - 4. Review required submittals, both completed and yet to be completed.
 - 5. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 6. Review required inspection, testing, certifying, and material usage accounting procedures.
 - 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
- C. Contractor shall record discussions of conference, including decision and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

1.5 PROJECT CONDITIONS

- A. Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store and handle roofing materials in a manner that will ensure that there is no

possibility of significant moisture pickup. Store in a dry, well-ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused materials on the roof overnight or when roofing work is not in progress. Store materials on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

- C. Materials shall be delivered in their original, unopened containers, clearly labeled with manufacturer's name brand name, and such identifying numbers as are appropriate.
- D. Adhesives shall be stored between 60 degrees F. and 80 degrees F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use.
- E. Do not use materials damaged in handling or storage. All cardboard containers shall be stored in dry area and in accordance with manufacturer's requirements.

1.7 WARRANTY

- A. Provide 20 Year No Dollar Limit Total System year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
 - 1. Limit of Liability: No limitation
 - 2. Scope of coverage: Repair any leak in system caused by: normal weather exposure, material defect of warranted materials, defect in workmanship and installation, and wind damage up to 72 mph.
 - 3. Coverage does not include damage due to winds in excess of 72 mph, hurricanes, tornadoes, hail, intentional damage or damage due to inspections, maintenance, or service of others.
- B. Comply with all warranty procedures required by manufacturer, including notifications, scheduling and inspections.
- C. Correct defective Work within a two year period after Date of Substantial Completion.
- D. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Roofing System: Firestone Building Products Co., Carmel, IN.
www.firestonebpco.com.
 - 1. Roofing systems by other manufacturers are acceptable upon strict compliance with the requirements of this Section and approval by the Architect.

2.2 ROOFING SYSTEM DESCRIPTION

A. Membrane system

1. Two ply modified bitumen consisting of a base sheet and granular covered cap sheet.
2. Membrane attachment: Full mopping of hot asphalt.
3. Slope as indicated on drawings.
4. Comply with applicable local building code requirements.

2.3 MEMBRANE AND SHEET MATERIALS

A. Firestone SBS Base sheet : ASTM D6163 Type I Grade S ; styrene-butadiene-styrene (SBS) modified, glass fiber reinforced.

1. Nominal Thickness: 90 mil

B. Firestone SBS FR Cap : ASTM D6164 Type I Grade G ; styrene-butadiene-styrene (SBS) modified, polyester reinforced.

1. Nominal Thickness: 150 mil
2. Color: White granule.

2.4 BITUMINOUS MATERIALS

A. Bitumen: Asphalt, ASTM D312 Type IV; for adhering insulation, use Type III.

B. Primer: ASTM D41, asphalt type.

C. Roof Cement: ASTM D4586, Type II.

2.5 PROTECTION COVER BOARD

A. Georgia-Pacific DensDeck Prime, or USG Secureroc.

1. Board Size: 48 x 96 inch, except as otherwise required by roofing system manufacturer.
2. Board Thickness: 1/2 inch
3. Board Edges: Square.

2.6 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 1, and with the following characteristics:

1. Compressive Strength: 20 psi
2. Board Thickness: As indicated on drawings
3. Board: Slope as indicated on drawings
4. Long Term Thermal Resistance (LTTR) value: 5.6 per inch
5. Manufacturer: Firestone Building Products

2.7 ACCESSORIES

- A. Ultraflash Liquid Flashing System consisting of Ultraflash Primer, Ultraflash Liquid Flashing, and Ultraflash Fabric. Provide around all roof penetrations as well as where pitch pans are required.
- B. Cant and Edge Strips: Asphalt-impregnated wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.
- C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
 1. SAE 1022 heat treated, corrosion resistant number 13 steel as furnished by membrane manufacturer.
 2. Size fasteners for 3/4 inch penetration through bottom of steel deck.
 3. Insulation fastening plates to be 2 7/8 galvalume coated steel as furnished by membrane manufacturer.
- D. Wood nailers: PS 20 dimension lumber, Structural Grade no.2 or better Southern Pine, Douglas Fir, or PS1, APA Ext Grade Plywood, pressure preservative treated.
 1. Width 3 1/2 inches, nominal, or as wide as the nailing flange of the roof accessory to be attached to it.
 2. Thickness: Same as the thickness of roof insulation.

2.8 FLASHING

- A. See Section 07600 - Flashing and Sheet metal for metal flashing product requirements for flashing to be provided and installed by roofing manufacturer and roofing installer.

2.9 WALKWAY PADS

- A. Install additional cap sheet layer using standard application techniques in configuration and sizes shown on the drawings wherever walkway pads are noted.

PART 3 INSTALLATION

3.1 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing

manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

- B. Insulation stops and/or nailers shall be as required by membrane manufacturer for slopes in excess of 1/2:12 to facilitate end lap fastening to prevent slippage of cap sheets. Sheets to be installed parallel to slope.
- C. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- D. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- E. Perform work using competent and properly equipped personnel.
- F. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- G. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.
- H. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
 - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
 - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
 - 4. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
 - 5. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and

their mechanical equipment and that deflection will no strain or rupture roof components or deform deck.

- B. Confirm that blocking/nailers are properly installed and secure in accordance with manufacturer's directions.
- C. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- D. Examine roof substrate to verify that it is properly sloped to drains.
- E. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions.
- F. Start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

- A. Take appropriate measures to ensure that fumes from asphalt, adhesives and solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.4 INSULATION INSTALLATION

- A. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
- B. Place insulation to the required slope pattern in accordance with manufacturer's instructions.
- C. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- E. Do not apply more insulation than can be covered with membrane in same day.

3.5 MEMBRANE APPLICATION

- A. Apply membrane in accordance with manufacturer's instructions.

- B. Apply membrane; lap and seal edges and ends permanently waterproof.
- C. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate.
- D. At end of day's operation, install waterproof cut-off. Remove cut-off before resuming roofing.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
 - 2. Apply flexible flashing over membrane.
- F. Around roof penetrations, mop in and seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.6 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.
- D. Disposal of Construction waste is the responsibility of the contractor. Perform in a manner complying with all applicable, federal, state and local regulations.

3.7 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

- A. The extent of each type of flashing and sheet metal work is indicated on the drawings and by provisions of this section. The types of work specified in this section include the following:
 - 1. Metal flashing and counter flashing
 - 2. Integral masonry and membrane flashing
 - 3. Special fabrications
 - 4. Metal copings, gravel stops, fascia, drip edges and trim
 - 5. Gutters and Downspouts

1.2 REFERENCES

- A. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), Architectural Sheet Metal Manual.
- B. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

- A. Submit manufacturer's product data, technical specifications, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Submit two 8 inch square samples of each specified sheet material to be exposed as finished surfaces.
- C. Submit two 12 inch long, completely finished units of specified factory fabricated products exposed as finished work.
- D. Submit shop drawings showing layout, joining, profiles, and anchorages of all fabricated work, including major counter flashings, expansion joint systems, and roof accessories. Plan layouts shall be at 1/4"= 1'-0" scale and details shall be at 3"=1'-0" scale.
- E. Submit experience record of flashing and sheet metal fabricator and installer including list of completed projects of similar size and scope of the work of this project.

1.4 JOB CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper

sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

1.5 QUALITY ASSURANCE

- A. Obtain products for each type of flashing or sheet metal systems from one source.
- B. Flashing and sheet metal installer shall have a minimum of 5 years experience in the installation of flashing and sheet metal similar in size, scope, and complexity to the work of this project.
- C. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Build mockups of special fabrications, copings, and drainage systems to demonstrate aesthetic effects and set quality standards for fabrication and installation. Protect approved mock-ups from damage until work is complete and accepted.
- E. Copings shall be certified by the manufacturer to meet performance design criteria according to the following test standards:
 - 1. ANSI/SPRI ES-1 Test Method RE-3 for Coping: Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems (current edition). The coping system shall be tested simultaneously on horizontal and vertical surfaces and shall exceed horizontal and vertical design wind pressure as calculated in accord with the ANSI/SPRI ES-1 Test RE-3. Use the current edition of ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
 - 2. The coping product shall be listed in current Factory Mutual Research Corporation Approval Guide approved for Class FM 1-90.

PART 2 PRODUCTS

2.1 METAL FLASHING AND TRIM

- A. Unless otherwise indicated, metal flashing and trim shall be fabricated from commercial quality galvanized steel, cold-rolled, conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275), 24 gauge and shall be shop fabricated with high performance fluoropolymer coating, not less than 0.0336 thick.
- B. Exposed sheet metal flashing and fabricated materials shall have Kynar 500 finish or approved equal.

2.2 MEMBRANE FLASHING

- A. Provide concealed flashings, or thru-wall flashing, shown to be built into construction that is approved or provided by membrane air barrier manufacturer.

See Section 07260 - Fluid Applied Membrane Air Barrier.

2.3 MISCELLANEOUS MATERIALS

- A. Provide sheet metal clips, cleats, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, fabricated of noncorrosive material and of size and gage required for performance.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads. Fasteners shall be same metal as flashing and sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
 - 1. Nails for Copper Sheet: 0.109 inch minimum and not less than 7/8 inch long copper or hardware bronze, barbed with large head.
 - 2. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 - 3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 - 4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 - 5. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
- C. Solder for Lead-Coated Copper: ASTM B 32, Grade Sn60, 60 percent tin and 40 percent lead.
- D. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Solder for Zinc-Tin Alloy-Coated Stainless Steel: ASTM B 32, 100 percent tin.
- F. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
- G. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.
- H. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- I. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 ROOF EDGE PRODUCTS

A. Provide products manufactured by:

1. OMG EdgeSystems, 4 Commerce Way, Arden, North Carolina 28704.
Tel: 828-676-1700. Web: omgedgesystems.com.
 - a. Equal products of other manufacturers are acceptable upon compliance with the requirements of this Section and approval of the Architect.
2. All metal products shall be galvalume to match metal panels. See Section

B. Permasnap Parapet Wall Coping

1. Coping shape and size shall be as indicated on drawings.
2. Coping sections shall expand and contract freely while locked in place on anchor cleats.
3. Coping sections shall lock to anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats.
4. All splice plates shall include factory applied dual non-curing sealant strips capable of providing a watertight seal.
5. Corners, end caps, pier caps, etc. shall be factory fabricated by the coping manufacturer. Outside corners shall be fully welded.
6. Metal for fabrication shall be 22 gauge galvalume.
7. Provide concealed splice plates, 8 inches wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
8. Anchor/Support Cleats shall be 20 gage prepunched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12 inches wide spaced at 4'-0" on center. Mechanically fastened as indicated and detailed on approved shop drawings.
9. Fasteners shall provide a minimum pull out resistance of 240 pounds per substrate application. No exposed fasteners shall be permitted. Fasteners shall be electrolytically compatible.
10. Furnish all necessary components, anchoring devices, splices, etc. necessary for a complete system.
11. Corners, end caps, pier caps, etc. shall be factory fabricated by the coping manufacturer. Outside corners shall be fully welded.

C. Gutter System

1. Heavy gauge gutter straps to securely support large volumes of water and extreme snow and icing conditions.

2. Gutter metal gauge shall be 22 gauge galvalume.
 3. Corners, end caps, expansion joints or exterior brackets shall be fabricated by manufacturer. Factory fabricated, mitered corners shall have 18 inch nominal leg lengths.
 4. Provide matching ledge caps, downspouts, or other special fabrications as detailed.
- D. Downspouts
1. Metal for fabrication shall be 22 gauge galvalume.
 2. Fabricate to shapes and sizes as indicated on drawings.
 3. Coordinate with adjacent flashings specified in other sections.
 4. Furnish all necessary components, anchoring devices, splices, etc. necessary for a complete system.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual" except as otherwise indicated.
- B. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units.
- C. Conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- D. Install all sill and head flashing with concealed end dams properly lapped and sealed as to prevent water intrusion around ends of flashing. Install sill and head flashing with laps, joints and seams which will be permanently watertight and weatherproof.

3.2 ACCESSORIES INSTALLATION

- A. Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with vapor barriers, roof insulation, roofing and flashing as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- B. Install flashing for masonry in accordance with the installation specifications in Section 04200 - Unit Masonry and with manufacturers instructions.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Installer shall advise Contractor of required procedures for surveillance and protection of flashings, sheet metal work, and accessories during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.
- C. Flashing and sheet metal with any cuts, abrasions, or imperfections will not be acceptable and shall to be replaced.

END OF SECTION

SECTION 07900

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for sealing joints in interior and exterior walls such as for doors, windows, louvers, pipes, metal panels, expansion joints in exterior walls, and other joints where dissimilar materials abut; setting of thresholds, sub-sills and similar installations; and at other locations as may be indicated on drawings.

1.2 WORK OF OTHER SECTIONS

- A. Sealant application may be performed as work of other sections when specified in that section. All sealant work shall conform to the requirements of this Section.

1.3 SUBMITTALS

- A. Submit manufacturer's product data on all products.
- B. Submit certification from sealant manufacturers that their products are suitable for the use indicated and comply with specification requirements.
- C. Submit manufacturer's color chart for full range of available colors. Submit cured sealant/caulk of color selected prior to application of materials.
- D. Submit a comprehensive list of all joints to be sealed listing the manufacturer recommended sealant to be used for that particular application.
- E. Submit qualifications of sealant installer/subcontractor including a list of successfully completed projects of similar size and scope to the work of this project.

1.4 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less or more 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.

1.5 QUALITY ASSURANCE

- A. Sealant products and sealant application shall meet or exceed the requirements of the latest edition of the following standards:
 - 1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 2. ASTM C1193 - Standard Guide for Use of Joint Sealants
 - 3. ASTM C834 - Standard Specification for Latex Sealants
 - 4. ASTM C 1311 - Standard Specification for Solvent Release Sealants
 - 5. ASTM C1330 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- B. Obtain elastomeric joint sealants from single manufacturer for each different product required to ensure compatibility.
 - 1. Sealant manufacturer shall have a minimum of 10 years experience in manufacturing sealants.
 - 2. Sealant manufacturer shall instruct applicator in procedures for intersecting sealants.
- C. The installer/subcontractor shall be an experienced applicator specializing in joint sealant installation with a minimum of 10 years experience in the installation of joint sealants. The installer/subcontractor shall have completed projects of similar size and scope to the work of this project.
 - 1. The installer/subcontractor shall designate a single individual as project foreman who shall be on site at all times during installation of sealants.
 - 2. The installer/subcontractor shall employ an adequate number of skilled workmen thoroughly trained and experienced in the necessary crafts to competently install sealants and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. Conduct a pre-installation conference to review sealant work. Attendees shall include the contractor, sealant subcontractor, sealant applicators, and Architect.
- E. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each kind of material, including

joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

F. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

1. In jobsite field samples prior to general installation, conduct field-tests for adhesion of joint sealants to actual joint substrates using proposed joint preparation methods recommended by manufacturer.
2. Conduct tests for each type of sealant and substrate.
3. Locate field-test joints where inconspicuous or as approved by Architect.
 - a. Include areas typical of those requiring removal of existing sealants and utilize methods proposed for sealant removal that have been pre-approved by Architect.
4. Use manufacturer's standard field adhesion test methods and methods proposed for joint preparation to verify proper priming and joint preparation techniques required to obtain optimum adhesion of joint sealants to joint substrate.
5. Evaluate and report results of field adhesion testing.
6. Do not use joint preparation methods or sealants that produce less than satisfactory adhesion to joint substrates during testing.
7. 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.

G. Standard of acceptance

1. Joints installed during pre-construction field adhesion testing that are accepted by Architect shall be retained as standard of acceptability and incorporated into Work of that area during general installation.
2. At least one such standard of minimum 5 feet in length shall be established for each type of sealant and substrate.
3. 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.

- H. Schedule applications of waterproofing, water repellents and preservative finishes after sealant installation unless sealant manufacturer approves otherwise in writing. Ensure that installed sealant is allowed to cure sufficiently prior to subsequent applications.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver caulking and sealant material to the site in original, unopened containers. Store materials under cover, protected from inclement weather.

1.7 WARRANTY

- A. Installer shall provide special warranty to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period of Three (3) years from date of Substantial Completion.
- B. Guaranty elastomeric sealants against adhesive and cohesive failure of the sealant and against infiltration of water and air through the sealed joint.
 - 1. Manufacturer shall provide special warranty to furnish elastomeric joint sealants to repair or replace sealants that do not comply with performance and other requirements specified in this Section within warranty periods listed below:
 - a. Silicone Sealants: Twenty (20) years from date of Substantial Completion.
 - b. Urethane Sealants: Five (5) years from date of Substantial Completion.
 - c. Other sealants: Three (3) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products listed.
 - 1. Comparable products of other manufacturers are acceptable upon approval by Architect.

2.2 MATERIALS

- A. 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 field testing and field experience.

- B. Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. 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.

2.3 SILICONE SEALANTS

- A. Single-Component, Ultra-low Modulus, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T, NT, M, G, A, and O, Non-staining to porous substrates per ASTM C 1248. Provide Dow Corning 790 or approved equal.
 - 1. Use at exterior vertical surfaces and horizontal non-traffic un-primed surfaces including:
 - a. Expansion and control joints
 - b. Curtainwall joints
 - c. Mullion joints
 - d. Stone Pavers
 - 2. Provide sealants in manufacturers full range of standard colors.
- B. Structural Sealant, Single-Component, neutral-cure, RTV (room temperature vulcanizing) silicone rubber sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, A and O. ASTM Specification C 1184 for structural silicone sealants. Provide Dow Corning 795 or approved equal.
 - 1. Use at structural and non-structural glazing, structural attachment of panel systems and above-grade weather sealing joints including:
 - a. Structural and non-structural glazing
 - b. Weather sealing perimeters of exterior openings where frames meet exterior facade including aluminum, steel, painted metal, glass, granite and other stone, concrete, plastics, and brick.

2. Provide sealants in manufacturers full range of standard colors.
- C. Single-component, high tensile strength, neutral-cure, elastomeric silicone sealant and adhesive for bonding glass, metal, and other building components: ASTM C920, Type S, Grade NS, Class 50, Use NT, G, and A. ASTM C1184, Type S, Use G, A, and O. Provide Dow Corning 995 Structural Sealant.
1. Use for silicone structural glazing and protective glazing applications.
- D. Single component, Multipurpose, Mildew-resistant, Acetoxy Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, and A. Provide BASF OmniPlus or approved equal.
1. Use at interior vertical surfaces and horizontal non-traffic surfaces where a sanitary seal is required including:
 - a. Sanitary seals in kitchen and bath areas
 - b. General-purpose HVAC and plumbing applications
 2. Provide sealants in manufacturers full range of standard colors.
- E. Single component, Low-modulus, non-sag, silicone sealant for high-movement joints for both new and remedial construction: ASTM C920, Type S, Grade NS, Class 100/25, Use T, A, M, and O. Provide Dow Corning NS Parking Structure Sealant (Non-Sag).
1. Use at high movement joints on vertical and horizontal surfaces including.
 - a. Parking lots
 - b. Sidewalks

2.4 LATEX SEALANTS

- A. Single-Component, Acrylic Latex Sealant, Class A for Flame Spread and Smoke Development when tested in accordance with ASTM E84. Provide STI SpecSeal Smoke 'N' Sound or approved equal.
1. Use at interior vertical surfaces and horizontal non-traffic surfaces with a smoke or sound rating including:
 - a. Smoke rated partitions
 - b. Sound rated partitions
 2. See Section 07270-Firestopping for sealants at fire rated partitions.
- B. Single-Component, siliconized acrylic latex sealant, ASTM C 834, USDA approved. Provide BASF Sonolac or approved equal.

1. Use at interior painted vertical surfaces included:
 - a. Painted Gypsum Drywall
 - b. Painted millwork and trim
 - c. Counter tops, vanities, venting and plumbing

2.5 URETHANE SEALANTS

- A. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use T. Provide BASF Sonolastic NP 1 or approved equal.
 1. Use at interior and exterior traffic surfaces including:
 - a. Concealed areas such as cap flashing, window sills and thresholds
 - b. Exterior sidewalk joints
 2. Provide sealants in manufacturers full range of standard colors.
- B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT. Provide BASF Sonolastic NP 2 or approved equal.
 1. Use at interior and exterior traffic surfaces and including:
 - a. Concealed areas such as cap flashing, window sills and thresholds
 - b. Exterior sidewalk joints
 - c. Joints immersed in water
 2. Provide sealants in manufacturers full range of standard colors.

2.6 BUTYL SEALANTS

- A. ASTM C 1311, butyl or polyisobutylene, single component, nondrying, non-skinning, non-curing, synthetic rubber sealant. Provide Tremco Curtainwall Sealant or approved equal.
 1. Use at metal to metal joints including but not limited to:
 - a. bedding for panels, sheets, rails, moldings, and other types of metal-to-metal sleeves
 - b. bedding thresholds, secondary glazing seals, and areas where a seal is required against Neoprene or EPDM gaskets.

2.7 ACCESSORIES

- A. Joint cleaner: non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- C. Provide closed or open-cell backer rod complying with ASTM C1330. Backer shall be designed for use with cold applied joint sealants and shall be acceptable to sealant manufacturer. Provide backer rod of size required for joint design.
- D. Bond breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Installer/subcontractor shall inspect substrate to which sealants are to be applied for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance
 - 1. Verify joint surfaces are clean and dry.
 - 2. Ensure concrete surfaces are fully cured.
- B. Notify Architect of conditions detrimental to the timely and proper installation of this material.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean the surfaces receiving the sealant to remove all paint, dirt, dust, oil lacquer, bitumen, rust and any other substances which would prevent proper adhesion of the material. Rake joints out to a minimum depth equal to one-half the width. Apply the primer as required after the preparations are completed.
- B. Prime masonry, concrete and other porous material as required by sealant manufacturer and conformance to pull test before the application of sealant material.

3.3 JOINT FILLER

- A. Where indicated and where required by depth of groove, provide a preformed

joint filler (backer rod) in the groove so that the depth of sealant will be equal to one-half the width of the joint. Material shall be packed into the joint, and when in place it shall be compressed at least 50 percent. Do not use fillers that are coated with or impregnated with bitumen or other substances that will affect the bonding qualities of the caulking or sealant.

3.4 INSTALLATION

- A. Install primer, sealants, backer rod, bond breaker, tape and other related products in accordance with ASTM C 1193 and manufacturer's instructions.
- B. Mixing, application, surface condition, weather condition shall be as recommended by the manufacturer. Do not use material that has exceeded the recommended pot life. Dress all beads smooth and clean excess material from surrounding surfaces. Remove beads that do not properly adhere to both surfaces and caulk or seal with new material.
- C. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

3.5 FIELD QUALITY CONTROL

- A. Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. 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.
1. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
 2. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. 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 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.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for steel frames, hollow metal doors and accessories.
- B. The extent of steel hollow metal doors and frames is shown on the drawings and schedules.

1.2 REFERENCES

- A. ANSI "American National Standards Institute"
- B. NFPA "National Fire Protection Association"
- C. SDI "Steel Door Institute"
- D. HMMA "Hollow Metal Manufacturers Association" a division of the National Association of Architectural Metal Manufacturers

1.3 QUALITY ASSURANCE

- A. Provide standard steel doors and frames manufactured by a single firm specializing in the production of this type of work.
- B. The work of this Section shall comply with the applicable portions of the following standards:
 - 1. ANSI A115 "Door and Frame Preparation for Door Locks and Flush Bolts".
 - 2. ANSI A 250.7 - 1997 or latest edition, "Nomenclature for Steel Doors and Steel Door Frames".
 - 3. ANSI A 250.8 - 1998, "Recommended Specifications for Standard Steel Doors and Frames"
 - 4. ANSI 250.10-1998 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames"
 - 5. NFPA 80 "Fire Doors and Windows", National Fire Protection Association.
 - 6. NFPA 101 "Life Safety Code", National Fire Protection Association.
 - 7. SDI Publications
 - a. SDI-105-98 Recommended Erection Instructions for Steel Frames
 - b. SDI-106-99 Recommended Standard Door Type Nomenclature
 - c. SDI-109-99 Hardware for Standard Steel Doors and Frames
 - d. SDI-110-84 Standard Steel Doors and Frames for Modular

Masonry Construction

- e. SDI-112-97 Galvanized Standard Steel Doors and Frames
 - f. SDI-117-93 Manufacturing Tolerances Standard Steel Doors and Frames
8. HMMA Publications
- a. HMMA 840-99 Guide Specifications for Installing and Storage of Hollow metal Doors and Frames
 - b. HMMA 850-00 Fire Rated Hollow Metal Doors and Frames
 - c. HMMA 861-00 Guide Specifications for Commercial Hollow metal Doors and Frames

1.4 FIRE-RATED ASSEMBLIES

- A. Wherever a fire-resistance classification is shown or scheduled for steel doors and frames, provide fire-rated assemblies investigated and tested as a fire door assembly, complete with type of hardware to be used.

1.5 SUBMITTALS

- A. Submit manufacturer's product data for each product specified.
- B. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames. For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- C. Shop Drawings shall be drawn at 1/4"=1'-0" for elevations and 3"=1'-0" for details and shall show the following:
- 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. Coordination of glazing frames and stops with glass and glazing requirements.
- D. Submit hardware preparation drawings.

1.6 COORDINATION

- A. Coordinate the work of this Section with the work of related sections including but not limited to work specified in Section 08700 - Finish Hardware, Section 08800 - Glazing and requirements of Division 16 - Electrical.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in accordance with manufacturer's instructions and referenced standards and guidelines.
- B. Deliver hollow metal work in cartons or crates to provide protection during transit and job storage.
- C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames at the building site under cover. Place the units on at least 4 inch high wood sills or on the floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber.

1.8 JOB CONDITIONS

- A. Installer must examine the substrate and conditions under which steel frames are to be installed and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide products of one of the following manufacturers:
 - 1. Ceco Door Products
 - 2. Steelcraft Doors and Frames
 - 3. Curries Company

2.2 MATERIALS

- A. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- B. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable
- C. Shop apply rust inhibiting primer suitable as a base for specified finish paints.

2.3 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. Hollow Metal Doors:
 - 1. Doors shall be full flush, fabricated from 18 gage steel. Exterior doors shall be full flush, fabricated from 16 gage steel. Exterior doors and other doors as indicated on the drawings shall be fully galvanized.

- a. Interior doors shall be reinforced by laminating panels to a cell honeycomb core and the complete unit closed with steel perimeter channels projection welded to face sheets.
 - b. Exterior doors shall be reinforced by laminating panels to a polyurethane core and the complete unit closed with steel perimeter channels projection welded to face sheets.
 2. The lock edge of the door shall be beveled 1/8 inch in 2 inches. Other edges of door are non-beveled with full height visible seams.
 3. Top and bottom channels shall be 14 gage steel, projection welded to both face sheets
 4. Hinge reinforcement shall be not less than a continuous 11 gage channel. Lock reinforcement shall be not less than a continuous 16 gage channel. Closer reinforcements shall be not less than 12 gage box type 18 inches long.
 5. Top channel shall be filled with epoxy and ground smooth.
- C. Standard Steel Frames:
1. Provide metal frames of the types and styles indicated on the drawings or schedules of not less than 16 gage steel for interior frames and 14 gage steel for exterior frames and interior frames 4'-0" and wider. Exterior frames and other frames as indicated on the drawings shall be fully galvanized.
 2. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings as shown on the drawings. Conceal all fastenings unless otherwise shown. Pressed steel frames shall be fabricated from cold rolled commercial quality prime steel sheets.
 3. Frames shall be press brake formed with 5/8 inch high integral stops. Door frames shall have channel spreaders tack welded in place at the bottom of the jambs. These shall be left in place until frames are set. Frames shall have continuous 1/2 inch returns where frame abuts gypsum board.
 4. Fabricate frames with mitered and welded corners. Weld flush face joints, including stops, continuously and grind, fill, dress, and make smooth, flush, and invisible. Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 5. Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 6. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
 7. Fabricate steel frames to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment to assure proper assembly at the project site.
 8. Anchors:

- a. Weld floor anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - b. Space anchors not more than 18 inches from top and bottom of frame and spaced at not more than 28 inches on center. Each jamb shall have a minimum of three anchors and one additional anchor per jamb for each 24 inches, or fraction thereof, for openings over 84 inches.
- D. Finish Hardware Preparation:
 - 1. Frames shall be reinforced, drilled and tapped for mortise hardware and reinforced only for surface applied hardware. Reinforcements for hinges shall be not less than 7 gauge plate or strip 1 inch in width and 10 inches in length offset so that hinges will finish flush with frame rabbet. Strike reinforcements shall be not less than 12 gauge and of adequate size to accommodate the strike specified.
 - 2. An approved hardware schedule together with the necessary templates are to be provided to the frame supplier. Provide double return throats at drywall construction. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with "Recommended Locations for Builder's Hardware", published by the National Builders' Hardware Association. Comply with applicable requirements of ANSI A115 "Door and Frame Preparation for Door Locks and Flush Bolts".
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of doors and frames.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- F. Louvers and vents: Coordinate the size, placement, and free area requirements of louvers and vents with Mechanical requirements.
- G. Shop Painting
 - 1. Clean, treat and paint exposed surfaces of fabricated hollow metal units. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before the application of the shop coat of paint.
 - 2. Apply shop coat of rust inhibiting baked on primer in accordance with ANSI A250.10-1998 of even consistency to provide a uniformly finished surface ready to receive field applied paint specified in Section 09900.
- H. Door Silencers
 - 1. Drill stops and install a minimum of 3 silencers on strike jambs of

single-swing frames and 2 silencers on heads of double-swing frames. Silencers shall be equal to Glynn-Johnson GL64 silencers.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect area and openings to receive steel door frames and report any conditions detrimental to the proper installation. Do not proceed with installation until conditions are corrected.
- B. Prior to installation, all frames must be checked for rack, twist and out of square conditions.

3.2 INSTALLATION

- A. Install frames, doors and accessories in accordance with architectural details, final shop drawings, and manufacturer's data and as specified herein.

3.3 PLACING FRAMES

- A. Install doors and frames in accordance with:
 - 1. SDI-105, "Recommended Erection Instructions for Steel Frames"
 - 2. SDI-110 "Standard Steel Doors and Frames for Modular Masonry Construction".
- B. Place frames prior to enclosing walls and ceilings. Set frames accurately in position, plumb, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Remove shipping bar spreader and insert a wood spreader cut to the opening width, notched to clear the stops.
- C. Fill frames in masonry walls with mortar. When temperature conditions necessitate an additive to be used in the plaster or mortar to prevent freezing, the contractor installing the frames shall coat the inside of the frames, in the field, with a bituminous coating conforming to ASTM D1187 - 97(2002)e1 Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
- D. Doors
 - 1. Install doors plumb and in true alignment in a prepared opening and fasten them to achieve the maximum operational effectiveness and appearance.
 - 2. Proper door clearance shall be maintained in accordance with SDI-110.
 - 3. Where necessary, only metal hinge shims are acceptable to maintain clearances.
 - 4. Install doors in accordance with "Installation Guide for Doors and Hardware" as published by DHI.
 - 5. Hardware shall be applied in accordance with hardware manufacturer's templates and instructions.
 - 6. Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper condition.

- 7. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply to touch-up or compatible air-drying primer.
- E. Install fire-rated doors and frames in accordance with NFPA Standard No. 80.
- F. Install six (6) metal wall anchors securely welded inside each jamb at hinge and strike levels of frames. In open steel stud partitions, install studs in wall anchor notches and wire tie. In closed steel stud partitions, attach studs to wall anchors with tapping screws.

3.4 ADJUST AND CLEAN

- A. Leave work in complete and proper operating condition. Remove and replace defective work, including frames which are warped, bowed or otherwise damaged.
- B. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

3.5 SCHEDULES

- A. After installation, copies of the door schedules shall be given to the owner as part of close out documents.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for wood doors including furnishing. The extent and location of each type of wood door is shown on the drawings and in schedules. The types of doors required include the following:
 - 1. Solid core flush wood doors with veneer faces
 - 2. Fire rated solid core flush wood doors with veneer faces

1.2 QUALITY ASSURANCE

- A. Provide doors meeting or exceeding the minimum standards as set forth by the following organizations unless standards are modified or exceeded by this specification.
 - 1. WDMA IS 1A-Window and Door Manufacturers Association
 - 2. Architectural Woodwork Institute (AWI), Section 1300 and 1500
 - 3. National Fire Protection Association (NFPA).
 - a. Where fire-resistance classifications are shown or scheduled for wood door assemblies, provide doors which comply with the requirements of NFPA No. 80 "Standard for Fire Doors and Windows" and which have been tested and rated with single point hardware by UL.
 - b. Provide each fire rated door with a label permanently attached to either the hinge stile or to the top rail, showing testing agency approval for classification scheduled.
- B. All doors shall be the product of the same manufacturer to ensure uniformity of quality and appearance throughout the project.
- C. The top of each door shall bear a label from the manufacturer indicating the door construction, face veneer species, cut and grade. If the doors are factory finished the label shall also have the finishing information.
- D. The Door Manufacturer shall provide a letter, signed by an authorized company representative, to the Architect stating that the doors have been manufactured in compliance with this specification.

1.3 SUBMITTALS

- A. Submit manufacturer's product description showing compliance with specifications, along with finishing instructions, installation instructions, and any

general recommendations manufacturer may have for the care and maintenance of each door type.

- B. Submit schedules and elevations indicating door sizes, swing, label, undercut, applicable hardware locations and construction including details of core and edge construction. Dimension and detail openings for glass lites, louvers, and grilles.
- C. Submit shop drawings, trim for openings, louvers and similar components.
- D. Submit 12 inch square samples of each type of flush wood door in each type of finish specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On-Site Care" recommendations of WDMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.
- B. No doors shall be delivered to the building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity range between 30 and 60 percent. Stack doors flat and off the floor, supported to prevent warpage. Protect doors from damage and direct exposure to sunlight.
- C. Doors shall be individually wrapped in polybags to protect the finish from damage by contact with other doors.
- D. Do not walk or place other material on top of stacked doors. Do not drag doors across one another.
- E. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be repaired or replaced by the contractor at no cost to the owner.
- F. Doors shall be palletized at factory in stacks of no more than 30 doors per pallet. Door edges shall be protected with heavy corner guards.

1.5 COORDINATION

- A. Contractor shall be responsible for coordination and acquiring of all necessary information from hardware and metal frame manufacturers.

1.6 WARRANTY

- A. All work in this Section shall be warranted by a full door warranty from the date of installation against defect in materials and workmanship, including the following:
 - 1. Delamination in any degree.

2. Warp or twist of 1/4 inch or more in any 3'-6" x 7'-0" section of a door.
 3. Telegraphing of any part of core assembly through face to cause surface variation of 1/100 inch or more in a 3 inch span.
 4. Any defect which may, in any way, impair or affect performance of the door for the purpose which it is intended. Replacement under this warranty shall include hanging, installation of hardware, and finishing.
- B. Periods of warranty after date of installation:
1. Interior solid core and mineral core Life of original installation.
 2. Exterior solid core - 1 year.
- C. Doors must be stored, finished, hung and maintained per manufacturers recommendations set forth in their Full Door Warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide wood doors as manufactured by one of the following:
1. Oshkosh Architectural Door Co.
 2. Eggers Hardwood Products Corporation
 3. Algoma Hardwoods, Inc
 4. Mohawk Flush Doors, Inc
 5. Marshfield Company
 6. Graham

2.2 MATERIALS AND COMPONENTS

- A. Provide manufacturer's standard face panels, unless otherwise specified. Provide same exposed surface material on both faces of each door, unless otherwise indicated.
- B. Fire-rated Doors: Provide exposed faces and edges to match non-fire-rated doors in the same area of the building, unless otherwise shown or scheduled. Provide trim for openings which have been tested and listed for the kind of door and rating indicated.
- C. Wood Louvers: Door manufacturer's standard solid wood louvers of same species as face veneers, unless otherwise specified and of the size, type and profile shown.

2.3 GENERAL FABRICATION REQUIREMENTS

- A. Cut and trim openings through doors and panels as shown. Comply with the applicable requirements of the referenced standards for the kind(s) of doors required.
- B. Wood Louvers: Factory install louvers in prepared openings.
- C. Metal Louvers: Factory cut openings. When standard service of door manufacturer, factory install metal louvers in prepared openings otherwise install only flush wood beads in prepared openings.

2.4 INTERIOR FLUSH WOOD DOORS

- A. Solid core construction shall be solid wood block, wood particleboard, or mineral with wood lock blocks, as required by door manufacturer to meet requirements. Doors shall be Type II water resistant BCNO.
- B. Exposed Surfaces for Transparent Finish: Where solid core interior wood doors are shown or scheduled to receive a transparent finish, provide Premium Grade, with Grade A faces, manufacturer's standard thickness face veneers complying with WDMA 1. S. Sharp contrast not permitted at veneer joints. Provide exposed edges and other exposed solid wood components of same species as face veneers.
- C. Species and Cut of Door: Rift Cut White Oak
- D. Pair and Set Match: Provide for pairs of doors and doors hung in adjacent sets.
- E. Transom and Side Panels: Wherever transom panels or side panels of wood are shown in same framing systems as wood doors, provide panels which match quality and appearance of associated wood doors, unless otherwise indicated. Fabricate matching panels with same construction, exposed surfaces and finish as specified for associated doors.
- F. Provide factory finishes after door is completed, including preparation of precision hardware, complying with AWI system TR6 or equivalent catalyzed polyurethane finish for open grain finish per section 1500.
 - 1. Finishes shall be applied in a dust-free, humidified environment.
 - 2. The sheen shall be satin or semi-gloss.
 - 3. Stain, if required, shall be as selected by Architect.
 - 4. Top and bottom of the doors shall be sealed.
 - 5. Doors shall be individually enclosed in a polybag.

2.5 FIRE RATED DOORS

- A. Fire rated doors shall meet the same requirements as Interior Flush Wood Doors. Core material shall be as required to meet listed fire rating. Ratings shall be as listed in door schedules on the drawings.

2.6 PREFITTING AND PREPARATION FOR HARDWARE

- A. Comply with the tolerance requirements of WDMA for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining.
- B. Provide a minimum of 5 inch top-rail blocking at doors indicated to receive closers.

2.7 LITE FRAMES

- A. Factory cut lite openings.
 - 1. Provide wood frames for lite openings in non-rated doors: Trim openings for non-fire-rated doors with solid wood moldings of profile shown, and if not shown, manufacturers standard profile.
 - 2. In rated doors, provide manufacturers standard frame of cold rolled steel, factory primed and compatible with door rating.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine door frames and verify that frames are of the correct type and have been installed as required for proper hanging of corresponding doors, Installer shall notify the Contractor in writing of conditions detrimental to the proper and timely installation of wood doors; do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer. Install fire-rated doors in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80.

3.2 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging. Install wood doors in accordance with manufacturer's instructions and as shown. Fit doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining. Bevel non-fire rated doors 1/8 inch in 2 inches at lock and hinge edges. Bevel fire rated doors 1/16 inch in 2 inches at lock edge.
- B. Prefit Doors: Fit to frames and machine for hardware to whatever extent required for proper fit and uniform clearance at each edge. For non-fire doors provide clearances of: 1/8 inch at jambs and heads; 1/8 inch at meeting stiles for pairs of doors; and 1/2 inch from bottom of door to top of decorative floor finish or covering, except where threshold is shown or scheduled provide 1/4 inch clearance from bottom of door to top of threshold. For fire-rated and smoke rated doors, provide clearances complying with the limitations of the authority having jurisdiction.

3.3 ADJUST AND CLEAN

- A. Rehang or replace doors which do not swing or operate freely, as directed by the Architect. Replace doors damaged during installation, as directed by the Architect.
- B. Protection of Completed Work: Installer shall advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of the work.

END OF SECTION

SECTION 08305

ACCESS DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for steel wall and ceiling access doors.
 - 1. Provide access doors at locations indicated on the drawings and in locations where required for appropriate access to items listed, in sizes as noted, scheduled or as required for adequate service access.
 - 2. Provide access doors at locations of junction boxes, valves, clean-outs, and similar mechanical, electrical, communication and other building systems concealed in walls and ceilings that require door access for working access.

1.2 QUALITY ASSURANCE

- A. Provide access doors manufactured by a company that has a minimum of five experience years in the manufacture of products similar in size and scope of the work of this project.
- B. Provide certificates and fire rating information.

1.3 COORDINATION

- A. Furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS

- A. Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices, and compliance with fire ratings specified where applicable.
- B. Submit shop drawings for fabrication and installation of access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.
- C. Submit complete Access Door Schedule indicating locations of all access doors, types, sizes, anchoring, ratings, latching or locking, and other pertinent data.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide access doors manufactured by Babcock-Davis, 9300 73rd Avenue North, Brooklyn Park, MN 55428; Tel: 763-488-9247 Web: babcockdavis.com

1. Equal products of other manufacturer's are acceptable upon strict compliance with the requirements of this section and approval by architect.
- B. Model BXTA, 24 gage steel insulated gasketed door, extruded aluminum frame, continuous stainless steel hinge, non-locking handle.
 1. Size: 24 inches by 24 inches.
 2. Paint in field to match wall paint finish.
- C. Model BNTC, 16 gage steel door and frame, concealed spring button hinge, screwdriver cam, white powder coat finish.
 1. Size: 24 inches by 48 inches.
- D. Model BIWK, 20 gage steel with 16 gage frame, self closing, UL rated, insulated, knurled knob/keyed slam latch, white powder coat.
 1. Size: 18 inches x 18 inches

2.2 MATERIALS AND FABRICATION

- A. Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.
- B. Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
- C. Fabricate Frames from 16 gage steel.
- D. Fabricate non-insulated doors from not less than 14 gage sheet steel with concealed continuous piano hinge. Fabricate insulated doors from not less than 20 gage sheet steel with concealed continuous piano hinge. Provide flush panel doors, unless otherwise indicated.
- E. Provide gasketing on doors located in fire or smoke rated partitions and other locations as identified. Smoke doors shall have UL listed smoke seals.
- F. Fire Rated Doors: Doors shall be self latching with automatic closer. Where access door units occur in a fire rated wall, door unit shall be a complete assembly UL rated as follows:
 1. 1 hour wall: 1 hour C label
 2. 1/2 hour ceiling: 1 hour C label
- G. Finish:
 1. Manufacturer's standard prime coat finish except where noted otherwise.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which access doors are to be installed and must notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions for installation of access doors. Mounting screws shall be standard flat head stainless steel self tapping sheet metal screws of the size required for proper support and attachment. Drywall screws are not acceptable.
- B. Provide treated solid wood blocking for attaching door frame at perimeter of opening. Secure blocking to framing members.
- C. Coordinate installation with work of other trades.
- D. Set frames accurately in position and securely attach to supports. Set face of panels level, square, and plumb in relation to adjacent finish surfaces.
- E. Field paint primed frames to match adjacent surface unless noted otherwise.

3.3 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation. Remove and replace panels or frames which are warped, bowed or otherwise damaged.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes electrically operated sectional doors, operators, controls and accessories.

1.2 REFERENCES

- A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated.
- B. American Society for Testing and Materials (ASTM):
 - 1. 1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 924/A 924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 3. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 4. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.3 PERFORMANCE STANDARDS

- A. Structural Performance:
 - 1. Wind Loads: Uniform pressure of: In accordance with governing code.
 - 2. Air Infiltration (ASTM E 283): Air leakage per foot of door perimeter (floor, jamb, and header) shall not exceed 0.81 CFM at 25MPH. No air leakage shall be detected between section joints when tested in accordance with ASTM E 283.
 - 3. Spring Cycle Requirements: 100,000 cycles.

1.4 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator

mounts and other related information required for a complete installation.

- C. Submit selection and verification samples of metal finishes.
- D. Submit manufacturer's certificate that products meet or exceed specified requirements.
- E. Submit installer qualifications including a list of successfully complete projects similar in scope to the work of this project.

1.5 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of five years experience in the manufacture of doors similar in design and construction to the doors specified for this project.
- B. Hold a pre-installation meeting verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.
- C. Installer shall have a minimum of 5 years experience in the installation of doors similar in size and scope of the work of this project and shall be trained and authorized by the door dealer to perform the work of this section.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 WARRANTY

- A. Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.
- B. Maintenance Service: Submit for Owner's consideration and acceptance maintenance service agreement for products installed.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. For the purposes of establishing quality the products of Raynor Door are indicated below. Products of other companies equal to the specified products are acceptable upon compliance with this specification.

1. Raynor Door, P.O. Box 448, 1101 East River Road, Dixon, IL 61021-

0448; Telephone: (800) 472-9667, (815) 288-1431; Fax: (815) 288-7142;
website: www.raynor.com.

2. Doors shall be equal to Raynor Door Electrically Operated Thermaseal Standard.

2.2 OPERATORS

A. Raynor PowerHoist Optima (Model Series RG):

1. Type: Trolley.
2. Motor Horsepower Rating: Continuous 1-1/2 HP.
3. Electrical Requirements: 120 volt single phase.
4. Duty Cycle: 30 cycles/hour.
5. Control Wiring: 24 volt control with provisions for connection of safety edge to reverse and external radio control hook-up.

B. Door Sections

1. Steel sandwich construction, 1-3/4 inches thick. Exterior section skin to be constructed of 25 gauge and interior skin to be 26 gauge hot-dipped galvanized (G60) steel in compliance with ASTM A 924 and ASTM A 653, with embossed stucco texture and injected polyurethane foam insulated core. Hinge reinforcement strips shall be 20 gauge galvanized steel, located within section interior at every hinge location. End stiles to be 16 gauge galvanized steel.
2. Mounting: Sections mounted in door opening using Lap Jamb Angle Mounting: section overlap door jambs by 1 inch on each side of door opening.
3. Insulation: Injected polyurethane, R-value of 16.4 and U-value of 0.061 when tested in accordance with ASTM C 518.
4. Seals: Interior and exterior skins to be separated by continuous hot melt bead to form thermal break and complete weatherseal along section joint. Bottom of door to have flexible U-shaped vinyl seal retained in an extruded aluminum retainer. Header seal on top section to prevent airflow above header. Header seal made of flexible dual-durometer vinyl.
5. Trussing: Doors designed to withstand specified windload. Deflection of door in horizontal position to be maximum of 1/120th of door width.
6. Exterior and Interior skins to have two coats of paint, one primer coat and one finish coat.

- C. Track: Provide 2 inch, normal headroom, hot-dipped galvanized steel (ASTM A-653), fully adjustable for adequate sealing of door to jamb or weatherseal.
 - 1. Mounting: Bracket-Mount using 2 inch adjustable track bracket for use with wood jambs.
- D. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5 to 1. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
- E. Hardware:
 - 1. Hinges and Brackets: Fabricated from galvanized steel.
 - 2. Track Rollers: Size consistent with track size, with hardened steel ball bearings.
 - 3. Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable without removal of track, mounting hardware, or door hardware.
 - 4. Locks: Furnish door system with exterior lock with five-pin tumbler cylinder, night latch and steel bar engaging track.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings square, flush and plumb. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.

3.3 ADJUSTING

- A. Lubricate bearings and sliding parts, assure weathertight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 INSTRUCTIONS

- A. Provide written instructions to owner for operation and maintenance of doors and accessories. Provide onsite demonstration of door and operational features to owner.

3.5 CLEANING AND PROTECTING

- A. Remove temporary coverings and clean door and accessories in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for aluminum storefront systems including doors and hardware.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings for the fabrication, installation and storefront systems. Include plans, elevations, details, and sections indicating connections to adjoining work. Indicate materials, finishes, fasteners, shims, joinery, flashing, end dams, and other information to determine compliance with specified requirements.
- C. Submit one fabricated corner sample approximately 12 inches by 12 inches.
- D. Submit Installer qualifications.

1.3 QUALITY ASSURANCE

- A. Installer shall be specialized in the installation storefront systems and have a minimum of five years experience in the installation of storefront systems similar in size and scope to the work of this project. The storefront system installer shall be acceptable to the storefront system manufacturer.
- B. The manufacturer shall have a minimum of five years experience in the manufacture of storefront systems similar in size and scope to the work of this project and shall be capable of providing field service representation during construction, approving acceptable installer and approving application method.
- C. Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
- D. Comply with applicable provisions of "Metal Curtain Wall, Window, Store Front and Entrance Guide Specifications Manual" by AAMA.
- E. Mock-up:
 - 1. Install at project site a job mock-up using approved products and installation methods to determine acceptability of storefront and installation methods. Obtain Architect's acceptance of mock-up prior to starting work.

2. Mock-up size shall be adequate to determine characteristics of installed system and shall include joints, penetrations, flashings, and other components representative of the installed system.
3. Maintain mock-up during construction for workmanship comparison.
4. Mock-up may be included in the Work if undisturbed at the time of completion of the storefront system.

1.4 COORDINATION

- A. Coordinate the work of this Section with the work of related sections including but not limited too the following.
 1. Coordinate layout and installation of electrified door hardware with connection to power supplies, fire alarm system and detection devices, access control system, and security system.
 2. Coordinate with the requirements of Section 08700 - Finish Hardware.

1.5 SYSTEM PERFORMANCE

- A. Wind loads: Provide framing system; include anchorage, capable of withstanding wind load design pressures inward and outward as required by the International Building Code in effect for the jurisdiction in which the project is located.
- B. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft² at a static air pressure differential of 6.24 psf.
- C. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 10 psf as defined in AAMA 501.
- D. Uniform Load: A static air design load of 30 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2 percent of their clear spans shall occur.
- E. Thermal Transmittance: When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than 0.46.
- F. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 60 for frame and 63 for glass.
- G. System performance criteria does not apply to screen porch framing.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to harmful weather conditions. Handle framing material and components to avoid damage. Protect framing material against damage from elements, construction activities, and other hazards before, during and after framing installation.

1.7 WARRANTY

- A. Provide manufacturer's two (2) year warranty from date of substantial completion of the project. In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Tubelite Inc. 3056 Walker Ridge Drive NW - Suite G, Walker, Michigan 49544. Tel: 800-866-2227 Web: www.tubeliteinc.com
- B. Products of other manufacturers equal in appearance, quality and performance are acceptable.

2.2 STOREFRONT SYSTEM

- A. Series: T14000 Series - Aluminum-Framed Storefront Thermally Broken
- B. Framing Member Profile: 2 inches x 4-1/2 inches nominal dimension. Center Glazed.
- C. Finish/Color: Clear anodized.
 - 1. Clear Anodized Finish: AAMA 611, Class I, AA-M10C21A41 clear anodic coating not less than 0.7 mils thick.

2.3 DOORS

- A. Glazed Doors: Tubelite wide stile entrance doors with 10 inch bottom rail. Finish shall be clear anodized. Refer to Section 08700 for door hardware.
- B. Screen Door: Tubelite wide stile entrance door with 10 inch bottom rail. Finish shall be clear anodized. Refer to Section 08700 for door hardware.

2.4 DOOR HARDWARE

- A. Provide manufacturer's standard door hardware unless indicated otherwise in Section 08700 - Finish Hardware.
1. Weatherstripping:
 - a. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
 - b. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
 - c. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (Necessary to meet specified performance tests).
 2. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.
 3. Butt Hinges - Screen Door: P092 Butt Hinges. Three (3) required.
 4. Push/Pull - Screen Door: Barrier-Free wire push and pull handle equal to P1565 Push and P1564 Pull.
 5. Closer - Screen Door: Equal to P2200 .
 6. Latch - Screen Door: Provide P023 thumb turn at interior and blank plate at exterior.
 7. Provide other hardware as required for a complete and functioning installation.

2.5 STOREFRONT MATERIALS

- A. Aluminum Framing and Components:
1. Material Standard: ASTM B 221; 6063-T6 alloy and temper for structural components and ASTM B 221; 6063-T5 alloy and temper for non-structural components.
 2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
 3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

B. Accessories

1. Fasteners: Where exposed, shall be Stainless Steel.
2. Gaskets: Glazing gaskets shall be extruded EPDM rubber.
3. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
4. Shims: Where shimming is required for alignment, shims shall be fabricated from solid and sound treated wood or other approved material.

2.6 SCREEN PORCH MATERIALS

- A. Fabricate screen porch framing as indicated on drawings from the following:
1. Vertical and horizontal tube framing: Part number E0002. 1 3/4 inches x 4 inches x 1/8 inch wall thickness. Door frame materials as required to match system.
 2. Applied stops: Part number E0939, 1/2 inch x 1/2 inch.
- B. Provide screws and other accessories as required for a complete installation as indicated on drawings.
- C. Clear Anodized Finish: AAMA 611, Class II, AA-M10C21A31 clear anodic coating.

2.7 FABRICATION

- A. Fabricate components in accordance with manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive storefront system and sill plate is level in accordance with

manufacturer's acceptable tolerances.

- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION

- A. Install framing system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.
- B. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
- C. Weathertight Construction: Install sill members and other members in a bed of sealant or with joint filler or gaskets, to provide weathertight construction. Coordinate installation with wall, sill and end dam flashing and other components of construction.
- D. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide blocking as required for installation.
- E. Provide alignment attachments and shims to align system to building structure. Shims shall be cut to exact thickness from solid treated wood or other approved materials. Maximum shim space between aluminum framing and rough opening shall be as recommended by manufacturer but no more than 1/2 inch.
- F. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.
- G. Install storefront systems in accordance with ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.3 FIELD QUALITY CONTROL

- A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
- B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.4 PROTECTION AND CLEANING

- A. Protect installed product's finish surfaces from damage during construction.

Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

- B. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for aluminum casement and projected windows with insulated glass.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings for windows and installation of windows. Include plans, elevations, and details indicating connections to adjoining work, anchoring, sealants, wall, sill and end dam flashing, and all other related work necessary to describe the complete installation.

1.3 QUALITY ASSURANCE

- A. Manufacturer shall be capable of providing field service representation during construction, approving acceptable installer and approving application method.
- B. Contractor shall conduct a pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements
- C. Installer shall be experienced in performing the work of this section, shall specialize in the installation of work similar to that required for this project, and shall be acceptable to product manufacturer.
- D. Provide sample installation for field review and to determine acceptability of window installation methods.
 - 1. Approved mockup shall represent minimum quality required for the Work.
 - 2. Approved mockup may remain in place within the Work upon approval.

1.4 SYSTEM DESCRIPTION

- A. Reference Standard Compliance: Comply with ANSI/AAMA 101 and AAMA 910 for minimum performance criteria for aluminum windows, including grade designation windows units.
- B. Test Units: Conform to minimum size in accordance with ANSI/AAMA 101 and AAMA 910 for each test unit sizes and configurations. Units submitted for laboratory testing shall be manufacturer's standard construction, glazed and assembled in accordance with manufacturer's specifications and ANSI/AAMA 101.

C. Window Performance Requirements:

1. Air Infiltration: The test specimen shall be tested in accordance with ASTM E283. Air infiltration rate shall not exceed 0.06 cfm/ft of sash perimeter at a static air pressure differential of 6.24 psf.
2. Water Resistance: The test specimen shall be tested in accordance with ASTM E547 and ASTM E331. There shall be no leakage as defined in test method at a static air pressure differential of 12 psf.
3. Uniform Load Deflection: A minimum static air pressure difference of 60 psf shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member.
4. Uniform Load Structural Test: A minimum static air pressure difference of 90 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.
5. Thermal Transmittance (U-value): When tested to AAMA Specification 503.1, the thermal transmittance (U-value) shall not be more than 0.60 BTU/hr/sf/°F.
6. Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 59 CRF for casement windows and 55 CRF for hopper windows.
7. Life Cycle Testing: AAMA 910 - 1250 cycles.

- D. System Performance Requirements: Provide aluminum windows which have been manufactured, fabricated and installed to withstand uniform loads from 100 psf and to maintain (manufacturer's performance criteria) without defects, damage, or failure.

1.5 WARRANTY

- A. Provide manufacturer's standard two (2) year warranty to start at date of substantial completion of the project.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver windows to jobsite in manufacturer's unopened cartons or crates.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Tubelite Inc. 3056 Walker Ridge Drive NW - Suite G, Walker, Michigan 49544.
Tel: 800-866-2227 Web: www.tubeliteinc.com

1. Products of other manufacturers equal in appearance, quality and performance are acceptable.
- B. Window styles:
1. Hopper: HW3700 top hinge / project out
 2. Casement: CW3700 out swing

2.2 MATERIALS

- A. Aluminum Windows and Components:
1. Material Standard: ASTM B221, G.S. 10A-T5; 6063-T5 alloy and temper.
 2. Frame Depth: Not less than 2 inches.
 3. Member Wall Thickness: Each member shall have minimum wall thickness of 0.125 inches for frames and 0.075 for sash and shall provide structural strength to meet specified performance requirements.
 4. Dimensions: Reference to dimensions for wall thickness and other cross-sectional dimensions of window members are nominal and in compliance with ANSI H35.2-1990.
- B. Mullions and Cover Plates: Shall be extruded aluminum of 6063-T5 alloy and temper of profile and dimensions indicated on drawings. Mullions shall provide structural properties to resist wind pressure required by performance criteria and standards.
- C. Thermal Barrier
1. Frame and sash thermal barrier shall a minimum of 5/16 inch separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.

2.3 ACCESSORIES

- A. Fasteners: Where exposed, shall be 300 Series, Stainless Steel.
- B. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- C. Sill Extension: Extruded aluminum, 6063-T5 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints

2.4 GLASS AND GLAZING

- A. General: Glass thickness and type shall be in accordance with manufacturer's recommendations for prescribed design pressure. Factory glazing shall be in accordance with manufacturer's standard requirements.

- B. Manufacturer's Standards: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be pre-shimmed glazing tape. Interior glazing shall be snap-in type .062 inch glazing beads and a compression gasket of dense elastomer in accordance with ASTM C864.
- C. Glass Materials:
 - 1. Insulating Glass: ASTM E774, NAMI Dual-Seal. Coordinate with Section 08800 - Glazing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate conditions are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive window units and sill plate is level in accordance with manufacturer's acceptable tolerances. Verify field measurements for window installation.

3.2 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during product installation.

3.3 INSTALLATION

- A. General: Install window units plumb, level, and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.
- B. Dissimilar Materials: Provide separation of aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points by complying with AAMA 101, Appendix, titled "Dissimilar Materials."
- C. Construction: Install sill members and other members in a bed of sealant or with joint filler or gaskets, to provide weathertight construction. Coordinate installation with wall flashings and other components of construction. Provide blocking as required for installation.

3.4 FIELD QUALITY CONTROL

- A. Field Tests: Architect shall select window units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
 - 1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Division 1 Testing Section for payment of testing and

testing requirements. Testing Standard per AAMA 502, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.

- a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.15 cfm per foot of crack length, which ever is greater.
 - b. Water Penetration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.
- B. Provide manufacturer's field service consisting of product use recommendations and periodic site visit during construction for inspection of product installation in accordance with manufacturer's instructions.

3.5 ADJUSTING, CLEANING AND PROTECTING

- A. Adjusting: Adjust operating window components to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.
- B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris. Provide final cleaning of glass and aluminum prior to
- C. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum windows from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum windows at no extra cost.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. The extent of hardware is shown on the drawings and in schedules. Finish hardware is hereby defined to include all items known commercially as builders hardware, as required for swing doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. The required types of hardware include (but are not necessarily limited to) the following:
 - 1. Butts and hinges
 - 2. Lock cylinders and keys
 - 3. Lock and latch sets
 - 4. Bolts
 - 5. Panic exit devices
 - 6. Push/pull units
 - 7. Closers
 - 8. Door trim units
 - 9. Stripping and seals
- B. Items of hardware not definitively specified, but required for the completion and proper operation of the doors, shall be suitable in type, comparable to the type specified for similar openings. Labeled doors shall be fitted with labeled hardware.

1.2 COORDINATION

- A. All modifications of hardware required by reason of construction characteristics shall be such as to provide the proper operation or functional features. Contractor shall be fully responsible for checking all details, such as wall trim clearance, bevels, backsets, proper type strike plates, length of spindles, hands of locks, etc., in order that all items of hardware shall fit properly. Hardware for application to metal shall be made to standard templates. Template information shall be furnished to door and frame fabricators and all other trades requiring same, in order that they may cut, reinforce or otherwise prepare in the shop, materials for reception of hardware.
- B. Coordinate layout and installation of recessed pivots and closers with floor construction.
- C. 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.
- D. Coordinate layout and installation of electrified door hardware with connection to

power supplies, fire alarm system and detection devices, access control system, and security system. Verify that the appropriate power supply for each type of powered device is provided.

1.3 QUALITY ASSURANCE

- A. Hardware shall be free from defects affecting appearance and serviceability. Working parts shall be well fitted and smooth working without unnecessary play.
- B. Installer shall have a record of completed work with successful in-service performance and shall have a minimum of five years experience in the installation of door hardware similar in material, design, and extent to that indicated for this Project
- C. Obtain all door hardware from a single source supplier. Door hardware supplier shall have warehousing facilities in Project's vicinity and shall employ a certified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- D. Architectural Hardware Consultant shall be certified by the Door and Hardware Institute as a Architectural Hardware Consultant and shall have a minimum of five years experience in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- E. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1.4 SUBMITTALS

- A. Submit product data, installation details, material descriptions, profiles and finishes on all hardware and accessories.
- B. Submit such samples as required by the Architect for approval. Do not deliver hardware until approval is obtained.
- C. Submit five copies of a complete schedule of all finish hardware required after all samples have been approved but prior to delivery of hardware. Schedule shall follow requirements of specifications and shall indicate type, manufacturer's name and number, location and finish of each item required. Approval of schedule will not relieve Contractor of responsibility for furnishing all necessary hardware.
- D. Submit 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.
- E. Submit product certificates signed by manufacturer of electrified door hardware certifying that products furnished comply with requirements. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

1.5 PACKING, MARKING AND DELIVERY

- A. Package each item of hardware and lockset separately in individual containers, complete with screws, keys, instructions and installation template for spotting mortising tools. Mark each container with item number corresponding to number shown on Contractor's hardware schedule.
- B. All items of hardware shall be delivered to the building site in sufficient time in advance of its requirement for use for inspection prior to installation.
- C. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- D. 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.

1.6 KEYS AND KEYING

- A. A keying conference shall be conducted with the Owner and Architect and shall be scheduled at such time to allow Owner input without delay to hardware delivery.
- B. All locks shall be set to a master key system and keyed in sets as directed by Architect and Owner.

1.7 WARRANTY

- A. Warranties specified in this Article 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 shall be for three years from date of Substantial Completion, unless otherwise indicated.
- D. Warranty period for delayed egress locks shall be 5 years from date of Substantial Completion.

- E. Warranty period for manual closers shall be ten years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 LOCKSETS

- A. Mortise locksets equal to Corbin/Russwin ML2000, NSA design, 626 finish

2.2 PLATES

- A. Shall be type as shown on the schedule. Plates shall be .050 gauge. Push plates shall have 1/2 inch radius corners and eased edges similar to Rockwood 70-RC series.

2.3 KEY CONTROL CABINET

- A. Provide metal cabinet with baked-enamel finish, containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with twenty (20) key capacity.
 - 1. Provide key cabinet equal to products of Lund Equipment Co. Inc. P.O. Box 213 Bath, Ohio 44210; Tel: 330-659-4800 Fax 330-659-9347; website: www.lundkeycab.net

2.4 SCREWS, BOLTS, ANCHOR AND OTHER FASTENING DEVICES

- A. Provide as required to secure each item of hardware. No attempt has been made to enumerate fastening devices in the accompanying hardware schedule. Exposed fasteners shall be finished to match the metal which they fasten.

2.5 SPECIALTY THRESHOLDS

- A. Provide abrasive cast aluminum thresholds for floor transitions at doors and at other locations at Apparatus Bay equal to Type 115M as manufactured by Wooster Products Inc, 100 Spruce Street, Wooster, Ohio. Tel: 330-264-2884 Web: woster-products.com
 - 1. Width: 5 inches
 - 2. Height: 1 inch
 - 3. Length: as required for each condition.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Mount hardware units at heights recommended in "Recommended Locations for

Builders' Hardware" NBHA, except as otherwise specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect.

- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- D. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar.
- E. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel which will not corrode in contact with the threshold metal.
- F. At exterior doors, and elsewhere as indicated, set thresholds in a bed of either butyl rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant.

3.2 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

DOOR HARDWARE SCHEDULE

Manufacturer List

Code	Name
AB	ABH Manufacturing Inc.
BE	Best Access Systems
BY	By Others
NA	National Guard
PR	Precision

SD	Stanley Door Closers
SE	Securitech
ST	Stanley
TR	Trimco

Option List

Code	Description
C	Quick Connect Wiring System
SN	Sex Nuts (Pkg. of 4)
B4E	BEVELED 4 EDGES - KICK PLATES
CSK	COUNTER SINKING OF KICK and MOP PLATES
IDH	Integrated Dr. Hardware (45HW,47HW)
VIN	Visual Indicator
VIT	Visual Indicator Thumb-Turn
EPT Prep	EPT Prep (full mortise)

Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
BLACK	Black
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull

HARDWARE SETS

HW1

Doors: 101A, 101B, 101C, 101D

Each opening shall have:

All hardware devices to hang, secure, close, and gasket door as supplied by Overhead Door Supplier.

HW2

Doors: 101E

Each opening shall have:

3	Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1	Lockset	45H-7TD14H PATD VIT	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA

1	Drip Cap	16 A - 4"	ODW	NA
1	Door Sweep	101 VA x LAR		NA
1	Threshold	896 S x LAR	AL	NA

HW3

Door: 117A

Each opening shall have:

1	Continuous Hinge	662HD UL x LAR	AL	ST
1	Lockset	45H-7TD14H PATD VIT	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Perimeter Gasketing	5075 B x LAR		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Door Sweep	101 VA x LAR		NA
1	Threshold	896 S x LAR	AL	NA

HW4

Door 119A

Each opening shall have:

1	Continuous Hinge	662HD UL 83" EPT Prep	AL	ST
1	Power Transfer	EPT-12C		PR
1	Electro-mech Lock	45HW-7DEU14H PATD C IDH	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Perimeter Gasketing	5075 B x LAR		NA
1	Door Sweep	101 VA x LAR		NA
1	Threshold	896 S x LAR	AL	NA
1	Wire Harness	WH-6E		ST
2	Wire Harness	WH-192P		ST
1	Power Supply	Power Supply by Owner's Security Contractor		BY
1	Door Position Switch	Door Position Switch by Owner's Security Contractor		BY
1	Card Reader	Card Reader by Owner's Security Contractor		BY

HW5

Doors: 119B

Each opening shall have:

1	Continuous Hinge	662HD UL 83" EPT Prep	AL	ST

1	Power Transfer	EPT-12C		PR
1	Electro-mech Lock	45HW-7DEU14H PATD C IDH	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Perimeter Gasketing	5075 B x LAR		NA
1	Wire Harness WH-6E			ST
1	Wire Harness WH-192P			ST
1	Power Supply	Power Supply by Owner's Security Contractor		BY
1	Door Position Switch	Door Position Switch by Owner's Security Contractor		BY
1	Card Reader	Card Reader by Owner's Security Contractor		BY

HW6

Door: 109

Each opening shall have:

3	Hinges	FBB199 4 1/2 X 4 1/2 NRP	US32D	ST
1	Set Flush Bolts	3820 x 3915	630	TR
1	Lockset	45H-7D14H PATD	626	BE
1	Coordinator	3094B3	Black	TR
2	Overhead Holder	9014 US32D		AB
2	Kick Plate	KO050 8" x 1" LDW x B4E CSK	630	TR
1	Astragal	139 SP x LAR		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Perimeter Gasketing	5075 B x LAR		NA
2	Door Sweep	101 VA x LAR		NA
1	Threshold	896 S x LAR	AL	NA

HW7

Doors: 120, 123A, 123B, 126, 129

Each opening shall have:

3	Hinges	FBB191 4 1/2 X 4 1/2	US32D	ST
1	Privacy Set	45H-0L14H VIN VIT	630	BE
1	Door Closer	CLD-4550 STD W/PA BRKT	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR

1	Coat Hook	3071	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW8

Door: 106

Each opening shall have:

3	Hinges	FBF191 4 1/2 X 4 1/2	US32D	ST
1	Privacy Set	45H-0L14H VIN VIT	630	BE
1	Door Closer	CLD-4550 STD W/PA BRKT	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Coat Hook	3071	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA
1	Auto Door Bottom	220 SA x LAR		NA
1	Saddle Threshold	See Specialty Thresholds		

HW9

Door: 121

Each opening shall have:

3	Hinges	FBF191 4 1/2 X 4 1/2	US32D	ST
1	Passage Set	45H-0N14H	630	BE
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW10

Door: 134, 135

Each opening shall have:

3	Hinges	FBF191 4 1/2 X 4 1/2	US32D	ST
1	Passage Set	45H-0N14H	630	BE
1	Door Closer	CLD-4550 STD W/PA BRKT	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW11

Door: 132, 133

Each opening shall have:

6	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Set Flush Bolts	3820 x 3915	630	TR
1	Passage Set	45H-0N14H	630	BE
1	Dustproof Strike	3911	630	TR
2	Overhead Stop	9024	US32D	AB
1	Perimeter Gasketing	5075 B x LAR		NA

HW12

Door: 105A, 136, 138

Each opening shall have:

3	Hinges	FBF168 4 1/2 X 4 1/2	US26D	ST
1	Passage Set	45H-0N14H	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW13

Door: 122, 124, 125, 127, 128, 130

Each opening shall have:

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Privacy Set	45H-0L14H VIN VIT	630	BE
1	Door Closer	CLD-4550 STD W/PA BRKT	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW14

Door: 131

Each opening shall have:

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Passage Set	45H-0N14H	630	BE
1	Overhead Stop	9024	US32D	AB
1	Perimeter Gasketing	5075 B x LAR		NA

HW15

Doors: 110, 111, 112

Each opening shall have:

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Lockset	45H-7T14H PATD	630	BE
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW16

Door: 114

Each opening shall have:

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Lockset	45H-7R14H PATD	630	BE
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gasketing	5075 B x LAR		NA

HW17

Door: 105B

Each opening shall have:

3	Hinges	FBF199 4 1/2 X 4 1/2 NRP	US32D	ST
1	Lockset	45H-7T14H PATD	630	BE
1	Door Closer	CLD-4550 CS SN	689	SD
1	Kick Plate	KO050 8" x 2" LDW x B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1	Perimeter Gasketing	5075 B x LAR		NA
1	Door Sweep	101 VA x LAR		NA
1	Threshold	See Specialty Thresholds		

HW18

Door: 108

Each opening shall have:

6	Hinges	FBF199 4 1/2 X 4 1/2	US32D	ST
1	Set Flush Bolts	3820 x 3915	630	TR
1	Passage Set	45H-0N14H	630	BE
2	Overhead Stop	9024	US32D	AB
1	Perimeter Gasketing	5075 B x LAR		NA

2	Door Sweep	101 VA x LAR		NA
1	Threshold	See Specialty Thresholds		

HW19

Door: 139

Each opening shall have:

3	Hinges	Factory Supplied and Installed	US32D	ST
1	Multipoint Mortise Latchset	Factory Supplied and Installed	630	SE
1	Perimeter Gasketing	Factory Supplied and Installed		NA
1	Auto Door Bottom	Factory Supplied and Installed		NA
1	Threshold	Factory Supplied and Installed	AL	NA

HW20

Door: 140

Each opening shall have:

6	Hinges	FBB199 4 1/2 X 4 1/2	US32D	ST
1	Set Flush Bolts	3820 x 3915	630	TR
1	Passage Set	45H-0N14H	630	BE
2	Overhead Stop	9024	US32D	AB
1	Perimeter Gasketing	5075 B x LAR		NA
2	Door Sweep	101 VA x LAR		NA
1	Threshold	See Specialty Thresholds		

HW21

Door: 117B

All hardware devices to hang, secure, close, and gasket opening as provided by aluminum door supplier.

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for glass, mirrors, setting materials, glass fabrications, specialty glass products, and related accessories.

1.2 QUALITY ASSURANCE

- A. Comply with published recommendations and requirements listed below except where more stringent requirements are indicated.
 - 1. Comply with GANA recommendations, specifications, informational bulletins and guidelines including but not limited to:
 - a. Glazing Manual (latest edition)
 - b. Laminated Glass Reference Manual (latest edition)
 - c. Sealant Manual (latest edition)
 - d. Engineering Standards Manual (latest edition)
 - e. TD 100-06 Standard Test Method for In-Plant Measurement of Roll Wave in Heat-Treated Architectural Glass (latest edition)
 - 2. Comply with the latest edition of the following ASTM standards:
 - a. C 1036 Specification for Flat Glass
 - b. C 1048 Specification for Heat-Treated Flat Glass, Kind HS, Kind FT Coated and Uncoated Glass
 - c. C 1503-01 Standard Specification for Silvered Flat Glass Mirror
 - d. Standard Specification for Laminated Architectural Flat Glass
 - e. Standard Specification for Insulating Glass Unit Performance and Evaluation
 - 3. Comply with the following guidelines, recommendations, and published standards of the Insulating Glass Manufacturers Alliance (IGMA).
 - a. Insulating Glass Manufacturing Quality Procedures.
 - b. North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
 - c. Design Considerations for Multiple-Cavity Insulating Glass Units
- B. Glazing installer/subcontractor shall have a minimum of 10 years experience in the installation of glass and related products on projects of similar size and

scope of the work of this project.

- C. All glass fabricated for each type of glass indicated shall be processed and supplied by a single fabricator.
- D. Where safety glazing labeling is indicated, permanently mark glazing with certification label of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- E. Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- F. Insulating Glass:
 - 1. Insulating Glass shall be permanently marked either on spacers or on at least one component lite of units with appropriate certification label of Insulating Glass Certification Council, IGCC.
 - 2. Insulating Glass Fabricator shall have a minimum of 5 years experience manufacturing sealed insulating glass units meeting ASTM E 2190, Class CBA.
 - 3. Insulating Glass Fabricator shall Certified by glass manufacturer.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and specification information on all glass, adhesives, sealants and other accessory products indicating conformance with specified characteristics.
- B. Submit Product Certificates signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- C. Submit glazing schedule listing glass types and thicknesses for each size opening and location using same designations indicated on Drawings for glazed openings.
- D. Submit two (2) samples, 12 inch square, of each glass product.
- E. Submit experience record and qualifications of glazing subcontractor including list of successfully completed projects of similar size and scope of the work of this project.

1.4 JOB CONDITIONS

- A. Do not perform work under adverse weather or job conditions.

1.5 HANDLING AND DELIVERY

- A. Protect glass during transit, storage, and handling to prevent scratching or breakage of glass. Replace all broken glass at no additional cost to owner.
- B. Handle glass in strict accordance with the glass manufacturer's directions.

1.6 WARRANTY

- A. Provide manufacturer's standard product warranty for each glass product listed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide glass by one of the following or approved equal.
 - 1. Vitro
 - 2. Old Castle Building Envelope
 - 3. Guardian Industries

2.2 MATERIALS

- A. Tempered Safety Glass
 - 1. Tempered glass shall be 1/4 inch clear float glass which is fully tempered in accordance with ASTM-C1048 and complying with the requirements of CPSC 16 CFR-1201 and ANSI Z.97.1
- B. Insulated Glass:
 - 1. Insulated glass fabricator shall be certified by the glass manufacturer. Insulated glass shall consist of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant spacer material, corner design and desiccant as follows:
 - a. Exterior lite - 1/4 inch clear, tempered
 - b. 1/2 inch air space
 - c. Interior lite - 1/4 inch clear, tempered
 - d. Coating on number 2 surface
 - e. Manufacturer's standard sealing system, spacer, desiccant and corner construction.

2. Performance characteristics shall be as follows:
 - a. Visible light transmittance - 58 percent
 - b. U-V transmittance - 14 percent
 - c. Shading coefficient - .34
 - d. Summer U-value - .28
 - e. Winter U-value - .29
 - f. Solar Heat Gain Coefficient - 0.30
3. Exterior lites shall be tempered in a manner to minimize the appearance of roller wave distortion. Lites with excessive distortion, as judged by the Architect, will not be acceptable. The maximum allowable deviation from flatness shall be .003 inch in the central area and .008 inch within 10 1/2 inches of the leading and trailing edge (typically the top and bottom of the unit).

C. Mirrors

1. Unframed mirrors shall equal to Ultra Mirror as manufactured by Guardian Consolidated, 110 Jack Guynn Drive, Galax, Virginia 24333. Tel: 800-822-5599. Web: gaurdianinglass.com
2. Mirrors shall be made from 1/4 inch primary float (Type 1) Ultra-Clear (Class 1) quality (Q1) glass in accordance with ASTM C 1036, Standard Specification for Flat Glass and ASTM C-1503-01, Standard Specification for Silvered Flat Glass Mirror.
3. Mirror edges shall be polished edge.
4. Mirror edges shall be sealed after fabrication with mirror edge sealant equal to CRL Aerosol Mirror Edge Sealant following the manufacturer's written recommendations.

2.3 SETTING MATERIALS AND ACCESSORIES

- A. Provide all necessary primers, sealants, channels, setting blocks, etc. with items to be glazed. Conform to requirements set forth in FGJA Glazing Manual.
- B. Mirror adhesive shall be Mirror-Mastic as manufactured by Palmer Products Corporation or approved equal.
- C. Mirror clips and angles shall be Knappe and Vogt number 318 ANO. Provide three clips at each mirror side, at top, and at bottom.

2.4 SPECIALITY GLASS

A. Fire Resistant Glass

1. Clear, wireless, laminated, minimum 1/4 inch thick impact safety rated glass ceramic equal to "FireLite Plus Premium Grade" as manufactured by Technical Glass Products, conforming to applicable U.L. fire resistance ratings as indicated or required for rated wall or adjacent door and frame assembly. Fire tested and rated, passes required Hose Stream Test, high impact safety (CPSC 16CRF1201 Cat. II).

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas in which glass is to be installed and report any conditions detrimental to the proper installation of glazing products to the Contractor. Do not proceed with installation until such conditions have been corrected.

3.2 GLAZING INSTALLATION

- A. Do not commence glazing work until the required primers have been applied and have dried. Clean all surfaces to which setting materials are to be applied to assure that the materials properly adhere and seal.
- B. All glazing shall be performed by experienced glaziers having highest quality workmanship. Glass shall be set without springing or forcing. Putty, glazing compound, stops and the like shall not project above the sight line. Exposed surfaces of putty and glazing compound shall be left straight, flat and clean. Corners shall be well formed.
- C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- D. Apply clear glazing compound around perimeter and at all glass-to-glass connections of butt-glazing system. Compound shall be the type recommended by the glass manufacturer for this particular installation.

3.3 STANDARDS AND PERFORMANCE

- A. Watertight and airtight installation of each glass product is required except as otherwise shown. Each installation must withstand normal temperature changes, wind loading and impact loading without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.
- B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.
- C. Glazing channel dimensions where shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with

reasonable tolerances. Adjust as required by job conditions at time of installation.

- D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated.

3.4 PREPARATION FOR GLAZING

- A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.5 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located 1/4 of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.
- B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- D. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- E. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- F. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.
- G. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel-bead.

3.6 DOOR LITES

- A. Install glass in metal frames in sizes as shown on the drawings. Where fire ratings are shown metal frames shall comply with applicable U.L fire rating.

3.7 MIRRORS

- A. Install mirrors in accordance with mirror adhesive manufacturers printed installation guidelines. Provide 3 mounting clips on each side of mirror, and at top and bottom, in addition to mirror adhesive.

3.8 CURE AND PROTECTION

- A. Protect glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.
- B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

3.9 CLEANING

- A. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.
- B. The General Contractor shall be responsible for removal of protective materials and cleaning with plain water, or water with soap or household detergent as approved by the glass manufacturer. The General Contractor shall be held responsible for damages resulting from the use of other cleaning material.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes insulated translucent sandwich panel wall system and accessories as indicated on drawings and specified herein. Work includes providing and installing:
 - 1. 2 3/4 inch thick factory prefabricated structural insulated translucent sandwich panels.
 - 2. Aluminum framing system to receive panels.
 - 3. Aluminum sill flashing.
 - 4. Louvers integral with system.

1.2 SUBMITTALS

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- B. Submit shop drawings for complete panel system including special conditions, inside outside corners, vertical off sets at corners, sills, heads, jambs. Include plans, elevations, and large scale details indicating connections to adjoining work including but not limited to masonry, metal panels, door and window jambs, structural steel soffits, and special conditions.
- C. Submit structural analysis data signed and sealed by a qualified professional engineer registered in the jurisdiction of the project.
- D. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
 - 1. Submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
 - a. Sandwich panels: 14 inches x 28 inches units
 - b. Factory finished aluminum: 5 inch long sections
- E. Submit installer qualifications and references.
- F. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

- G. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least three consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type to the work of this project.

1.4 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads: Provide system capable of handling the loads indicated on Structural Drawings.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.6 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. The basis for this specification is for products and services by Kalwall Corporation, 1111 Candia Road, PO Box 237, Manchester, NH, 03105. Tel: (800) 258-9777 Web: kalwall.com
- B. Other manufacturers providing products and services equal in quality, color, shape, size, configuration, that comply with all of the performance requirements of this specification may be acceptable upon submission of evidence of compliance and review and approval by the Architect.

2.2 PANEL COMPONENTS

A. Face Sheets

- 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (polycarbonate, acrylic) faces will not be accepted.
 - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
- 2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1 inch.
- 3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244

after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.

- b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 foot pounds without fracture or tear when impacted by a 3-1/4 inch diameter, 5 pound free-falling ball in accordance with UL 972.

4. Appearance:

- a. Exterior face sheets: Smooth .070 thick and crystal in color.
- b. Interior face sheets: Smooth.045 thick and white in color.
- c. Face sheets shall not vary more than $\pm 10\%$ in thickness and be uniform in color.

B. Grid Core

- 1. Width of I-beam shall be no less than 7/16 inch.
- 2. I-beam Thermal break: Minimum 1 inch, thermoset fiberglass composite.

C. Laminate Adhesive

- 1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
- 2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
- 3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50 percent Relative Humidity at 68 degrees F: 540 PSI
 - b. 182 degrees F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182 degrees F: 250 PSI.

2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
- B. Panel 1, without interior insulation:
 - 1. Thickness: 2-3/4 inches
 - 2. Light transmission: 35%
 - 3. Solar heat gain coefficient .052.
 - 4. Panel U-factor by NFRC certified laboratory: 2-3/4 inch thermally broken grid .053
 - 5. Grid pattern: Nominal size 10 inch vertical pattern "Vertikal".
- C. Panel 2, with insulation:
 - 1. Thickness: 2-3/4 inches
 - 2. Light transmission: 20%
 - 3. Solar heat gain coefficient .28.
 - 4. Panel U-factor by NFRC certified laboratory: 2-3/4 inch thermally broken grid .23
 - 5. Grid pattern: Nominal size 10 inch vertical pattern "Vertikal".
- D. Standard panels shall deflect no more than 1.9 inch at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- E. Standard panels shall withstand 1200 degrees F fire for minimum one hour without collapse or exterior flaming.
- F. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish:
 - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color shall be Coro Blue KCRF.

2.5 ACCESSORIES

- A. Provide fastening devices and other accessories required for a complete and functioning wall system as indicated on drawings and specified herein.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure, and installation conditions and report any conditions unsatisfactory to a proper installation of the system.
- B. Do not proceed with panel installation until any unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. 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 recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

- A. Install the panel system in strict accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
 - 1. Anchor component parts securely in place by permanent mechanical attachment system.
 - 2. Accommodate thermal and mechanical movements.
 - 3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

- A. Clean the panel system interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other sections of the specifications. Specific locations where the various materials are required are shown in schedules and on the drawings.

1.2 SAMPLES

- A. Samples shall be submitted for approval prior to applying or installing finishes or items included in this section in accordance with the respective section for the product indicated and Section 01340 - Shop Drawings, Product Data and Samples. The Architect may make revisions to the Color Schedule upon receipt of samples.

PART 2 PRODUCTS**2.1 MANUFACTURER'S TRADE NAMES**

- A. Manufacturer's trade names used herein identify quality, colors, finishes, textures, and patterns for materials and products specified.
- B. Reference by trade name or manufacturer shall identify the product required. The contractor shall follow instructions in Section 01630 - Substitutions and Product Options if a substitution is proposed.

2.2 DISCONTINUED PRODUCTS

- A. The Architect shall be promptly notified if any color, finish, texture and/or pattern for materials specified herein is determined to be out of current production by the manufacturer.
- B. Contractor and supplier shall make a determination if any warehouse stock is still available based on the approximate quantities (including attic stock) required for the work.
- C. In the absence thereof, the contractor shall make a submittal to the Architect based on the closest match to the discontinued product, by either the original manufacturer or a comparable substitution.
- D. No action towards purchasing of any discontinued products (either warehouse stock or by substitution) shall be taken until the submittal and approval process has been completed.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation of finishes or products requiring selection of finish or color are specified in the respective section for that product and/or finish.

3.2 COLOR SCHEDULE

- A. Abbreviations for types of finishes indicated in the color schedule and finish schedule are as follows:

- 1. TCF - Textile Composite Flooring
- 2. RF - Resinous Flooring
- 3. DRF - Decorative Resinous Flooring
- 4. RB - Rubber Base
- 5. SSM - Solid Surface Material
- 6. P - Paint
- 7. EP - Epoxy Paint
- 8. ST - Wood Stain
- 9. ACT - Acoustical Ceiling Tile
- 10. LMC - Linear Metal Ceiling
- 11. PMP - Preformed Metal Panel
- 12. FRP - Fiberglass Reinforced Panel
- 13. WP - Wall Protection
- 14. SP - Solid Plastic Toilet Partitions
- 15. PL - Plastic Laminate

- B. Floors

- 1. Textile Composite Flooring
 - a. TCP - 1: J & J Kinetex Style Propel 1817 Color 1703 Roll
- 2. Resinous Flooring
 - a. RF - 1: Stonclad GS color Pewter
- 3. Decorative Resinous Flooring
 - a. DRF-1: Stontec ERF Custom Large Flake XVII-TEC- 90B with matte finish.
- 4. Painted Floors
 - a. Color to be selected
- 5. Rubber Base
 - a. RB - 1: Johnsonite / #63 Burnt Umber

C. Walls and Vertical Surfaces

1. Paint colors selected from Sherwin Williams
 - a. P-1: SW 1015 Skyline Steel (283-C3)
 - b. P-2: SW 7663 Monorail Silver (233-C3)
 - c. P-3: SW 7661 Reflection (233-C1)
 - d. P-4: SW 7605 Gale Force (279-C3)
2. Stain
 - a. Color to be Selected
3. Fiberglass Reinforced Panel
 - a. FRP-1: Color To Be Selected
4. Wall Protection Panel
 - a. WP-1: Color To Be Selected
 - b. WP-2: Color To Be Selected

D. Ceilings

1. Acoustical Ceiling Tile
 - a. ACT - 1: Armstrong Fine Fissured Square Lay In White
2. Linear Metal Ceiling
 - a. MC-1: Rockfon Planar Macro Open Reveal Color To Be Selected from manufacturer's wood powder coat selections.
3. Preformed Metal Panel
 - a. PMP-1: Color To Be Selected

E. Miscellaneous

1. Solid Surfacing Material
 - a. SSM-1: Corian Deep Sea
 - b. SSM-2: Corian Savannah
 - c. SSM-3: Tower Industries Meridian Solid Surface color Bone

2. Solid Plastic:
 - a. SP-1: Hiny Hiders Color Linen / Orange Peel Texture
3. Door Frame Color:
 - a. P-4: SW 7605 Gale Force (279-C3)
4. Roller Shades:
 - a. Housing: Custom color with matching blackout side channels where indicated.
 - b. Blackout Fabric: Equinox Blackout Fabric Series 0100. Color to be selected.
 - c. Shade Fabric: Thermoveil Dense Basket Weave 1500 series 3 percent openness factor color to be selected from full range of colors.

F. Exterior Colors

1. Metal Panels:
 - a. Galvalume
2. Metal Trim and Flashing:
 - a. Galvalume
3. Aluminum Storefront and Windows:
 - a. Clear anodized
4. Insulated Translucent Wall System:
 - a. Framing material: Kalwall Coro Blue KCRF
5. Overhead Doors:
 - a. Door panels: White
 - b. Steel frame: SW 1015 Skyline Steel (283-C3)
6. Pre-engineered Canopies:
 - a. Mapes Night Horizon Blue
7. Masonry:
 - a. Face Brick: Cherokee, Vel Medium Gray

- b. Glazed Brick Type 1: Elgin Butler Classic Red - 8800
- c. Glazed Brick Type 2: Elgin Butler Cobalt - 2200A

END OF SECTION

SECTION 09250

GYPSUM DRYWALL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for gypsum board, gypsum board sheathing, cement board, metal framing and related accessories. The extent of the gypsum drywall work is shown on the drawings and in schedules, and is hereby defined to include gypsum board work with a tape-and-compound joint treatment system known as drywall finishing work. The types of work required include the following:
 - 1. Gypsum drywall metal support system including studs, tracks, furring and related materials.
 - 2. Gypsum drywall including interior gypsum board, gypsum sheathing, cement board, trims, reveals, and related accessories.
 - 3. Drywall finishing including joint tape-and-compound treatment and sanding.

1.2 SUBMITTALS

- A. Submit product data for each product specified.
- B. Submit shop drawings indicating layout of required control joints in drywall.
- C. Submit qualifications of gypsum board installer and finisher including references.
- D. Submit detail of UL Designs for each fire rated assembly indicated on drawings.

1.3 QUALITY ASSURANCE

- A. Comply with applicable requirements of the latest editions of:
 - 1. ASTM C1396/1396M, Standard Specification for Gypsum Board
 - 2. ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products"
 - 3. ASTM C840, Standard Specification for Application and Finishing of Gypsum Board
 - 4. ASTM C 645 requirements for metal.
- B. Comply with requirements and recommendations of the latest editions of:

1. Steel Stud Manufacturer's Association
 2. The Gypsum Construction Handbook as published by USG.
- C. Comply with applicable requirements of the latest editions of the following Gypsum Association publications, except where more detailed or more stringent requirements are indicated including the recommendations of the manufacturer.
1. GA-216 - Application and Finishing of Gypsum Board
 2. GA-600 - Fire Resistance Design Manual
 3. GA-214 - Recommended Levels of Gypsum Board Finish
 4. GA-226 - Application of Gypsum Board to Form Curved Surfaces
 5. GA-238 - Guidelines for Prevention of Mold Growth on Gypsum Board
 6. GA-239 - Water-resistant Gypsum Backing Board for Ceramic Tile in Wet Areas.
 7. GA-253 - Application of Gypsum Board Sheathing
 8. GA-801 - Handling and Storage of Gypsum Panel Products
- D. Where work is indicated for fire resistance ratings, including fire resistant ratings required to comply with governing regulations. Provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL, ASTM and FM.
- E. Allowable Tolerances: Less than 1/16 inch offsets between planes of board faces, and 1/4 inch in 8'-0" for plumb, level, warp and bow.
- F. Obtain gypsum boards, framing and fasteners, trim accessories, adhesives and joint treatment products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.
- G. Gypsum board finisher/installer shall have a minimum of five (5) years experience in the installation and finishing of gypsum board systems similar in size and scope to the work of this project.
- H. Prepare mock-up of level 5 gypsum board finish a minimum of 9 feet tall by 20 feet long. Demonstrate the proposed workmanship to be expected in completed work. Obtain Architects approval and acceptance of visual quality of mock-up before start of work. Retain mock-up panel during construction as a standard for judging completed work. Mock-up, if approved, may be incorporated into the work.

1.4 PRODUCT HANDLING

- A. Deliver gypsum drywall materials in sealed containers and bundles, fully

identified with manufacturer's name, brand, type and grade.

- B. Store gypsum drywall materials in a dry, well ventilated space, protected from the weather, under cover and off the ground.

1.5 JOB CONDITIONS

- A. Installer must examine the substrates and the spaces to receive gypsum drywall, and the conditions under which gypsum drywall is to be installed and shall notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Building shall be completely enclosed and weather-tight prior to installing gypsum board. Gypsum board and related materials shall be allowed to acclimate to building temperature and humidity levels before installation. Temperature shall be maintained between 55 and 85 degrees Fahrenheit with relative humidity between 20 percent and 85 percent prior to, during, and after installation.
- C. Maintain ambient temperatures as indicated above for a period of 24 hours before drywall finishing, during finishing installation, and until compounds are completely dry.

PART 2 PRODUCTS

2.1 METAL SUPPORT MATERIALS

- A. Interior Studs: ASTM C 645, 20 gage (0.0329 inch thickness) x 3-5/8 inches deep, except as otherwise indicated. Provide stud manufacturer's standard accessories such as clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system. Runners shall match studs and shall be type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work. Studs, around showers and other wet areas, shall be G-40 hot dipped galvanized in accordance with ASTM 653/A653M.
 - 1. "EQ" (Equivalent Gauge Thickness) Steel Studs and Runners that can show certified third party testing with gypsum board in accordance with ICC ES AC86 need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645-09. The submission of a recognized evaluation report is acceptable to show conformance to this requirement.
 - 2. Gauge equivalent drywall framing shall meet the minimum performance requirements of conventional drywall framing as defined by the Steel Framing Industry Association (SFIA) and the Steel Stud Manufacturers Association (SSMA).
 - 3. Gauge equivalent calculated design properties shall be based on AISI

S100-07, North American Specification for Design of Cold-Formed Steel Structural Members.

- B. Provide 20 gage studs, or heavier gage as required to support applied loads and meet design requirements, at the following locations:
 - 1. At all openings, including but not limited to, door and window jambs and headers.
 - 2. At walls indicated to support wall mounted cabinets, shelving, handrails, grab bars, shower seats, equipment, or surface applied fixtures unless indicated otherwise.
 - 3. At walls scheduled to receive ceramic, porcelain, glass, or stone tile.
 - 4. At walls over 12 feet unbraced height
- C. Provide 20 gage deep leg deflection track assembly at heads of walls to deck. Deflection track shall be equal to ClarkDietrich MaxTrak Slotted Deflection Track. Provide fire-stop deflection track equal to ClarkDietrich BlazeFrame Fire Stop Deflection track at fire rated walls. Assembly shall allow structure above wall to deflect without affecting lateral integrity of wall, crushing or deforming studs or damaging gypsum board.
- D. Furring Members: ASTM C 645, 25 gage, hat-shaped. Where shown as resilient provide manufacturer's special type designed to reduce sound transmission.
- E. Backing Plate: 0.0312 inch (20 gauge) steel, unless noted otherwise.
- F. Fasteners: Type and size recommended by furring manufacturer for the substrate and application indicated.

2.2 GYPSUM BOARD PRODUCTS

- A. To the extent not otherwise indicated, comply with GA-216, as specified and recommended. Exposed gypsum board shall be equal to Type X, fire rated type with tapered long edges as manufactured by United States Gypsum Company and as follows:
 - 1. Edge Profile: Special rounded or beveled edge.
 - 2. Sheet Size: 4'-0" width by maximum length available which will minimize end joints.
 - 3. Thickness: 5/8 inch thick except where otherwise indicated.
- B. Provide exterior grade gypsum board sheathing at all exterior wall applications. Gypsum Board Sheathing shall be equal to:

1. USG Securock Glass-Mat Sheathing 5/8 inch, Type X.
- C. Provide 5/8 inch thick water-resistant type gypsum board, Type X , fire rated, at all toilets, kitchens, janitors closets, mechanical rooms, behind drinking fountains and similar damp areas and where indicated, except where otherwise indicated. Install in Apparatus Bay and other areas not serviced by HVAC units.
- D. Provide 5/8 inch thick water-resistant type gypsum board, Type X , fire rated, foil backed gypsum board at wall between unconditioned spaces and spaces served by HVAC unit. See plan for location.

2.3 GYPSUM BOARD TRIM ACCESSORIES

- A. Manufacturer's standard galvanized steel bead and trim units with flanges for concealment in joint compound including corner beads, casing beads (L and J trim) and control joints. Provide semi-finishing type (flange not concealed) where indicated.

2.4 GYPSUM BOARD JOINT TREATMENT MATERIALS

- A. General: ASTM C 475, type recommended by the manufacturer for the application indicated, except as otherwise indicated.
 1. Joint Tape: Perforated type
 2. Joint Compound: On interior work provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or non-casein-type for topping. On exterior work provide water resistant type.
 3. Gypsum Board Sheathing Joint Tape: 2 inch wide 10 x 10 glass mesh as recommended by sheathing manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board. Gypsum board fasteners shall comply with GA-216.
- B. Provide type S-12, bugle head, self tapping, fine thread, rust resistant screws at exterior gypsum sheathing applications.

PART 3 EXECUTION

3.1 COORDINATION

- A. Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed.

- B. Coordinate metal framing with the installation of speciality doors and frames including but not limited to acoustic doors, radiation protection doors and windows, equipment provided by Owner and similar installations.

3.2 METAL SUPPORT SYSTEM INSTALLATION

- A. To the extent not otherwise indicated, comply with ASTM C754 "Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products" and manufacturer's instructions. Furnish concrete inserts, steel deck hanger clips, and similar devices to other trades for installation well in advance of time needed for coordination with other work. Isolate stud system from transfer to structural loading, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Install runner tracks at floors, ceiling and structural walls and columns where gypsum drywall system abuts other work. Terminate partition stud systems as shown, braced each side at 45 degrees at 4'-0" o.c., except where indicated to be extended to structural support or substrate above. Space studs 16 inches o.c., except as otherwise indicated.
- B. Provide galvanized studs around showers and other wet areas as indicated on the drawings.
- C. Install additional studs and headers at door and window frames as indicated, but not less than two (2) at each. Space jack studs over door frames at same spacing as partition studs with bottom runner secured to door frame.
- D. Install supplementary framing, runners, furring, blocking, backing plates and bracing where indicated on drawings and at locations required to support fixtures, equipment, grab bars, shower seats, handrails, heavy trim, furnishings, and similar work.
- E. Provide additional structural stud framing, supplemental bracing, and anchors as required to support all dead and dynamic loads for door assemblies, window openings, and other penetrations that require additional reinforcing due to the weight of door, frame, or glazing. Framing members shall be anchored to the building structure in such a manner to provide sufficient stability and maintain finished wall integrity without movement, deflection, or excessive vibration under typical conditions.

3.3 GYPSUM BOARD INSTALLATION

- A. Comply with manufacturer's instructions and requirements for fire resistance ratings in addition to GA-216 compliance.
- B. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At high walls, install boards horizontally with end joints staggered over studs. Form control joints and expansion joints with space between edges of boards prepared to receive trim accessories.

- C. Cover both faces of steel studs with gypsum board in concealed spaces, including above ceilings, unless indicated otherwise, except in non rated chase walls which are properly braced internally. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than eight (8) square foot area, and may be limited to not less than 75 percent of full coverage.
- D. Floating construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated or unless control or expansion joints are indicated.
- E. Where sound-rated drywall work with an STC rating is indicated, seal the work at perimeters, control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with manufacturer's recommendations for location of beads, and close off sound flanking paths around or through the work, including sealing of partitions above acoustical ceilings
- F. Install gypsum board control joints in walls, ceilings and furr downs in accordance with ASTM C 840, Recommended Levels of Gypsum Board Finish, and in accordance with the following locations
 - 1. Partitions and Furring: Install control joints in partitions and wall furring runs exceeding 30 feet. Space control joints not more than 30 feet o.c. in any direction. Install control joints in furred assemblies where control joints occur in adjacent and base exterior wall.
 - 2. Ceilings: Unless otherwise shown on the drawings, Install control joints in areas exceeding 2500 sq. ft. Space control joints not more than 50 feet on center. Install control joints where ceiling framing or furring changes direction.
 - 3. Space fasteners in gypsum board in accordance with GA-216 and manufacturer's recommendations, except as otherwise indicated.
 - 4. Install exposed gypsum board by fastening with screws.

3.4 GYPSUM BOARD SHEATHING INSTALLATION

- A. Install gypsum board sheathing in accordance with manufacturer's specifications and recommendations and applicable portions of GA-253 and ASTM C 1280.
- B. Attach gypsum board sheathing to metal studs with corrosion resistant screws at 8 inches on center along entire length of stud and at 8 inches on center along perimeter framing.
- C. Seal and tape all joints and penetrations.

3.5 DRYWALL TRIM ACCESSORY INSTALLATION

- A. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work. Coordinate the installation of corner beads with corner protection specified in Section 10260 - Wall Protection. Corner beads are not required at outside corners where corner protection is specified and indicated on drawings.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints.) Install metal control joint (beaded type) where indicated or required for proper installation.

3.6 DRYWALL FINISHING

- A. Where finishing is required, apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, using type of compound specified herein and recommended by manufacturer.
- B. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
- C. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.
- D. Base for Ceramic Tile: Do not install drywall finishing where ceramic tile and similar rigid applied finishes are indicated.
- E. Unless otherwise indicated, install drywall finishing at all gypsum board exposed to view and to receive finishes. Where not exposed to view and above ceilings install at all fire rated, smoke, sound rated walls. Install finishing above ceiling at air returns, conference, toilet, private office, mechanical, and electrical room walls.
- F. Install gypsum board finishing in accordance with the latest editions of ASTM C 840, GA-214 "Recommended Levels of Gypsum Board Finish", and in accordance with the following schedule:

1. Taping, finishing, and corner beads are not required. Locate at concealed areas and ceiling plenum areas, except where a higher level of finish is required for fire-resistance rated assemblies and sound rated assemblies. Generally described as Level 0 finish in GA-214.
2. At joints and angles, embed tape in joint compound. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable. Locate at concealed areas and ceiling plenum areas, except where a higher level of finish is required for fire-resistance rated assemblies and sound rated assemblies. Generally described as Level 1 finish in GA-214.
3. At joints and angles, embed tape in joint compound and apply one separate coat of joint compound over tape, fastener heads, and flanges of trim accessories. Joint compound applied on the face of the tape when the tape is embedded is considered a separate coat. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable. Locate where panels are a substrate for tile or where indicated. Generally described as Level 2 in GA-214.
4. All joints and interior angles have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free from tool marks and ridges. Locate in areas to be decorated with a medium or heavy texture or where heavy-grade wall coverings will become the final decoration. Generally described as Level 3 in GA-214.
5. At joints and angles, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and flanges of trim accessories. Panel surfaces and joint compound must be smooth and free of tool marks and ridges. Locate at all panels where exposed to view or where painting or wall covering is the finish. Generally described as Level 4 in GA-214.
6. Finish must be equal to Paragraph 4 (embedding coat and three finish coats) plus a skim coat over the entire gypsum board surface. Surfaces must be smooth and free of tool marks and ridges. Locate where indicated on drawings. Generally described as Level 5 in GA-214-96.

3.7 PROTECTION OF WORK

- A. Protect gypsum drywall work from damage and deterioration during the remainder of the construction period.
- B. Replace and refinish damaged board prior to substantial completion of project.

END OF SECTION

SECTION 09280 SUSPENDED GYPSUM DRYWALL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. The types of work required include the following:
 - 1. Ceiling suspension systems.
 - 2. Drywall system face-type gypsum board work.
 - 3. Trim and accessories which are installed prior to or concurrent with gypsum board.
- B. The extent of the suspended gypsum drywall systems is shown on the drawings and in schedules.

1.2 REFERENCES

- A. (ASTM) American Society for Testing and Materials
- B. (U. L.) Underwriters Laboratory
- C. (CISCA) Ceiling and Interior System Construction Association.
- D. (GA) Gypsum Association

1.3 SUBMITTALS

- A. Submit manufacturer's product data, specifications and installation instructions gypsum drywall system, including other data as may be required to show compliance with these specifications.
- B. Submit installer qualifications including list of completed projects.
- C. Submit two samples of suspension system components, gypsum products and accessories.

1.4 QUALITY ASSURANCE

- A. Provide gypsum drywall products produced or recommended by a single manufacturer.
- B. Suspended Gypsum Drywall System Installer/Subcontractor shall have a minimum of five years experience in the installation of systems similar in size and scope of the work of this project.
- C. Comply with the following requirements, references and publications:

1. ASTM C635, Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 2. ASTM C636, Recommended Practice for Installation of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 3. ASTM C645, Standard Specifications for Non-load (AXIAL) Bearing Steel Studs, Runners and Furring Channels for Screw Application of Gypsum Board.
 4. ASTM E-119 - Standard Methods of Fire Test of Building Construction and Materials.
 5. (U. L.) Fire Resistance Directory (latest directory)
 6. (CISCA) Ceiling System Installation Handbook.
 7. GA 216, Installation of Gypsum Panels
- D. Allowable Tolerances: 1/8 inch offsets between planes of board faces and 1/4 inch in 8'-0" for plumb, level, warp and bow.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver gypsum drywall materials in original and unopened sealed containers and bundles, fully identified with manufacturer's name, item description, brand, type, part number, type, class and grade as applicable.
- B. Handle materials in such a manner as to prevent racking, distortion or other physical damage.
- C. Store in a dry well ventilated space, protected from the weather, under cover, and off the ground.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide heavy duty, gypsum drywall furring suspension system as manufactured by USG Corporation.
- B. Equal products of the following companies are acceptable:
 1. Armstrong
 2. Chicago Metallic Corporation

2.2 CEILING SUPPORT MATERIALS

- A. All suspension system components shall meet ASTM Heavy Duty Classification.

- B. All furring runners and furring cross tees shall be 1 1/2 inches high double web, heavy duty, .020 electro-galvanized steel with 1 1/2 inch wide flange.
- C. All cross tees shall be 1 1/2 inches high double web, heavy duty, .020 electro-galvanized steel with 1 1/2 inch flange.
- D. Wall molding shall be .020 inch thick electro-galvanized steel angle 1 1/2 inch high with 1 inch wide flange.

2.3 TRIM ACCESSORIES

- A. Provide standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
- B. Semi-Finishing Type: Manufacturer's standard trim units which are not to be finished with joint compound (non-beaded).
- C. Plastic Edge Trim: Manufacturer's standard rigid or semi-rigid PVC moldings of the semi-finishing type, shaped to provide resilient contact of gypsum board edges with other work; friction-fit, or pressure-sensitive adhesive mounting.
- D. Gypsum Board Fasteners: Number 6, Type-S complying with ASTM C1002, with GA-216 and with gypsum board manufacturer's recommendations.

2.4 GYPSUM BOARD

- A. Refer to Section 09250 - Gypsum Drywall for requirements.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all components in accordance ASTM C636, CISCA installation standards and manufacturer's printed instructions.
- B. Furring main runners shall be installed 48 inches on center and shall be directly suspended by not less than 12 gage galvanized steel wire spaced at 48 inches on center along the furring runners. Hanger wires shall be wrapped tightly with a minimum of three full turns.
- C. Secure hanger wires directly to structure where possible, otherwise tie to inserts, clips and other anchorage devices or fasteners as indicated.
- D. Furring main runners shall be interconnected by furring tees 48 inches long spaced at 16 inches on center. Furring tees and cross tees shall also be

installed adjacent to all recessed light fixtures on each side not supported by a furring runner. Coordinate size and type of opening in framing with light fixture type and direction.

- E. Wall moulding shall be installed wherever suspension components meet vertical surfaces. Suspension component ends shall be butt cut to fit into the wall track.
- F. Gypsum drywall panels shall be screw attached to the suspension system main runners and furring tees with conventional drywall screws.
- G. Attach the long dimension of the gypsum panel parallel to the main runner and perpendicular to the furring tee. Stagger joints between gypsum panels.
- H. Coordinate and integrate the installation of trim accessories with the installation of gypsum board. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Extent of each type of acoustical ceiling is shown and scheduled on drawings. Types of acoustical ceilings specified in this section include acoustical panel ceilings and suspension systems.

1.2 QUALITY ASSURANCE

- A. Provide acoustical panel units and grid components by a single manufacturer.
- B. Installer shall have not less not less than five (5) years of successful experience in installation of acoustical ceilings similar in size and scope to work of this project. The installer shall be acceptable to manufacturer of acoustical ceiling.
- C. UL Rated Assemblies: Where acoustical ceilings are components of floor, roof or beam assemblies indicated for fire-resistance rating, including those required for compliance with governing regulations, provide acoustical materials and application or suspension bearing UL Classification Marking for applicable UL design number listed in UL "Fire Resistance Index". Where required by applicable UL design, provide protection materials for fixtures and ducts.
- D. UL Fire Hazard Classification: Where acoustical ceilings are indicated to comply with fire hazard classification for flame spread, including fuel contribution and smoke development classifications, provide acoustical materials which have been tested, rated and labeled by UL for indicated ratings as listed in "Classified Building Materials Index".
- E. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: As follows, tested in accordance with ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
- F. Installation shall conform to ASTM C636 / C636M - 08 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- G. Provide Seismic Reinforcing and Restraint Systems as required by the following:
 - 1. Seismic Design Category: Site Class D
 - a. Comply with the requirements of ASTM E 580/E 580M-06, Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
 - b. Comply with ASCE 7 Section 11.6 and ASCE 7 Section 13.5.6.2.2.
 - c. Comply with CISC recommendations for installation methods.

2. IBC Occupancy Category: IV
3. Component Importance Factor: 1.5

1.3 SUBMITTALS

- A. Submit manufacturer's product data, specifications and installation instructions for each acoustical ceiling material and suspension system required, including certified laboratory test reports and other data as required to show compliance with these specifications.
- B. Submit manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.
- C. Submit installer qualifications including list of successfully completed projects.
- D. Submit two (2) samples of each acoustical tile product and accessory.
- E. Submit letter from manufacturer stating that installer is acceptable for installation of manufacturer's products.

1.4 JOB CONDITIONS

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings completed and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 COORDINATION

- A. Coordinate the work of this Section with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, and partition system.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Armstrong World Industries, Inc. or approved equal.

2.2 ACOUSTICAL TILE

- A. Acoustical Panel ACT-1
 1. Size - 2 X 2
 2. Manufacturer's name and number - Fine Fissures 1728 - WH.

3. Description - Lay-in Square Edge

2.3 CEILING GRID

A. Grid System

1. Manufacturer's name - Prelude 15/16 inch exposed Tee grid
2. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized steel in accordance with ASTM A 653. Main beams and cross tees shall be double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel with baked polyester paint. Main beams and cross tees shall have rotary stitching. Cross runners shall be coped to lay flush with main runners. Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system, including moldings, trim, and accessories. Structural Classification: ASTM C 635/C 635M-07 Intermediate Duty. Or select other as required by 1.2 G
3. Finish: Manufacturer's standard white baked enamel finish unless otherwise selected by Architect.

B. Grid System Accessories

1. Edge Moldings: Manufacturer's standard channel molding for edges and penetrations of ceiling with single flange of molding exposed. Finish shall be white baked enamel finish unless otherwise indicated.
2. Channel Molding where required shall be Armstrong 7830.
3. Hold-Down Clips: Provide steel clips where required for wind uplift resistance, seismic requirements, or fire-resistance rating. Provide accessible type at locations indicated on shop drawings.
4. Hanger Wires: Galvanized carbon steel, ASTM A 641, soft temper prestretched, yield-stress load of at least 3 times design load, but not less than 12 gage, 0.106 inch.
5. Attachment devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
6. Provide additional accessories, restraints, perimeter closures, and other accessories as required by Article 1.2, Paragraph G.

C. High Humidity Finish

1. Comply with ASTM C 635 requirements for Coating Classification for Severe Environment Performance where high humidity finishes are required.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine conditions under which acoustical ceiling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION

- A. Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings. Measure each ceiling area and establish layout of acoustical units to balance border widths at borders.
- B. Layout ceiling as indicated on reflected ceiling plans. Contact Architect if field conditions, such as room size, shape, or layout differ from those indicated on reflected ceiling plan. Do not install grid or tiles until discrepancy is resolved.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.
- B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers near each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8 inch in 12'-0". Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
- C. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Screw-attach moldings to substrate at intervals not over 16 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely. For seismic requirements indicated, install edge moldings type and method in accordance with ASTM E 580/E 580M-06.
- D. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings. Space hold down clips as recommended by panel manufacturer unless otherwise indicated or required.
- E. As required by Article 1.2, Paragraph G, fasten ceiling to framing to resist the vertical seismic design forces and the weight of the ceiling and all connected light fixtures, sprinklers, HVAC appurtenances.
- F. As required by Article 1.2, Paragraph G, provide independent support of lighting fixtures, diffusers, cable trays, electrical conduit, sprinklers, HVAC, and other ceiling appurtenances.

3.4 ADJUST AND CLEAN

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for linear metal ceiling system as indicated on the drawings. Furnish all panel grilles, suspension dowel clips, heavy duty main T-grid curved beams, and other components necessary for a complete installation in accordance with plans and specifications.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for all supplied ceiling materials.
- B. Submit shop drawings showing panel grille lengths, placement of hangers, main beam carriers, and other details required for a complete and proper installation. Include plans, elevations, and details indicating connections to adjoining work.
- C. Submit 12 inch x12 inch assembled ceiling sample with specified finish.
- D. Submit installer qualifications including training, experience, and references.

1.3 QUALITY ASSURANCE

- A. Comply with publications referenced below.
 - 1. CISCA "Ceiling Systems Handbook"
 - 2. Standard for Ceiling Suspension System Installations - ASTM C 636
 - 3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
 - 4. IBC (International Building Code) Standard for Seismic Zone for local area.
- B. The manufacturer shall have a minimum of five (5) years of experience in manufacturing suspended ceilings of similar in size, complexity, and scope to the work of this project.
- C. Conduct a pre-installation meeting to include the ceiling installer, electrical subcontractor, general contractor, and architect.
- D. The ceiling shall be fire resistant and panel grilles shall conform to Class 1, or A flame spread rating, when tested according to ASTM E-84.
- E. The installer shall have a minimum of two (2) years experience in installation of

suspended ceilings similar in design, scope, and complexity to the work of this project.

F. Mock-up:

1. Within two weeks of approval of material submittals install a mock-up for each type, style, finish, size, and color of panel grille ceiling including accessories, light fixtures, reveals, corners, edges, and other components of the ceiling system. Mock-up shall be a minimum of 10 feet x 10 feet and will be reviewed for quality, color range, pattern, and workmanship.
2. Provide special features as directed.
3. Obtain Architect's acceptance of the mock-up before start of work. Retain mock-up during construction as a standard for judging completed work. Do not alter, move, or destroy mock-up until work is completed.

G. Seismic Reinforcing System

1. Seismic Design Category: D
 - a. Comply with the requirements of ASTM E 580/E 580M-06, Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
 - b. Comply with ASCE 7 Section 11.6 and ASCE 7 Section 13.5.6.2.2.
 - c. Comply with CISC recommendations for installation methods.
2. Risk Category: IV
3. Component Importance Factor: 1.5

1.4 PROJECT CONDITIONS

- A. Mechanical, electrical, and other utility service installations above the ceiling plane shall have been completed. No materials shall rest against, or wrap around, the ceiling suspension components or connecting hangers.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver system components in manufacturer's original unopened packages, clearly labeled.
- B. Store components in fully enclosed dry space. Carefully place on skids, to prevent damage from moisture and other construction activities.
- C. Handle components to prevent damage to surfaces and edges, and to prevent distortion and other physical damage.

PART 2 PRODUCTS

2.1 SYSTEM

- A. Equal to 8 inch PlanarMacro Open Reveal Perforated w/ Acoutex Backer manufactured by Rockfon, 4849 S. Austin Avenue, Chicago, IL 60638.

2.2 SYSTEM MATERIALS

A. Panel Profile

1. Panels shall be roll formed from .032 inch thick aluminum with square edges; 8 inches wide, 5/8 inch deep with 3/4 inch reveal.
2. Panels shall be perforated.

B. Linear Suspension System

1. Carrier: Universal hat-shaped, .038 inch roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels at 2 inches on-center and 27/32 inch apart. Support holes spaced 4 inches on-center. Finish shall be factory-applied black enamel.
2. Hanger Wire: 12 gage galvanized carbon steel hanger wire.

- C. Panel finish shall be decorated wood powder coat as selected by Architect from manufacturer's full range of available color/texture options.

2.3 ACCESSORY MATERIALS

- A. Panel End Caps: Formed, stamped, or milled end caps with matching finish.
- B. Panel Splice: Formed aluminum insert designed to snap-fit between ends of two ceiling panels. Finish shall match panel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which metal panels attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal panel ceilings.
- B. Report conditions detrimental to a proper installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling

anchors whose installation is specified in other Sections.

- B. Measure each ceiling area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.
- C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.
- D. Establish layout of panels and support members in accordance with manufacturer's approved shop drawings and installation instructions.
- E. Furnish steel deck hanger clips or similar devices for installation in time to coordinate the work.

3.3 INSTALLATION

- A. Install panel grilles in strict accordance with approved shop drawings and manufacturer's instructions and installation guidelines.

3.4 CLEANING AND PROTECTING

- A. Make final adjustments to level or contours.
- B. Upon completion of ceiling installation, all panel grilles and borders shall be cleaned free of dirt, dust, grease, oils, and fingerprints. Wood strips shall be wiped with furniture polish approved by manufacturer to enhance the surface finish.
- C. All work which cannot be successfully cleaned or repaired, shall be removed and replaced.

END OF SECTION

SECTION 09650

RESILIENT BASE

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes rubber base. The extent of resilient base and accessories is shown on the drawings and in the finish schedule.

1.2 QUALITY ASSURANCE

- A. Match resilient base for color and pattern by using products from the same series of cartons in the same sequence as manufactured and packaged.
- B. Installer/subcontractor shall hold a pre-installation meeting with Contractor, Owner's representative and Architect to review products, job conditions, layouts, and coordination procedures prior to installing resilient flooring.

1.3 SUBMITTALS

- A. Submit manufacturer's product data, specifications and installation procedures for each type of resilient flooring item.
- B. Submit manufacturers cleaning and maintenance instructions, including a recommended list of cleaning products to be used. Include precautions against materials and methods which may be detrimental to finishes. Clearly annotate any type of cleaning solution or method that should not be used or will cause damage to the product.

1.4 JOB CONDITIONS

- A. Maintain 70 degree F. temperature for a minimum of 48 hours prior to installation and continuously during installation. Maintain 70 degree F temperature after completion of installation as recommended by flooring manufacturer but not less than 48 hours. Maintain a minimum lighting level of 50 foot-candles during installation.

1.5 COORDINATION

- A. Coordinate the work of this Section with work of other sections. Verify other work that may interfere with the proper installation of tile flooring and accessories.

PART 2 PRODUCTS

2.1 RUBBER BASE

- A. Rubber base shall be Roppe Pinnacle Rubber Wall Base or equal.

1. Composition: 100 percent Virgin Thermoset Vulcanized Rubber
2. Height: As scheduled
3. Thickness: .125 inch
4. Style: Cove
5. Length: Continuous for length of wall with no seams.
6. Provide preformed inside and outside corners to match base.
7. Color shall be as selected in Section 09050 - Color Design.

2.2 ACCESSORIES

- A. Resilient Edge Strips: Homogenous vinyl composition, tapered edge, as manufactured by Roppe, model no. 177 or approved equal.
- B. Provide adhesives as recommended by rubber base manufacturer to suit substrate conditions.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which resilient flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the installation, product performance, and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PREPARATION

- A. Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.
- B. Prior to laying flooring, broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.
- C. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors. Use a 4'-0" straight edge adjacent to all walls to verify no gaps or depressions will occur upon installation of base materials.

3.3 INSTALLATION

- A. Accessories: Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in as long lengths as practicable. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces. Install without any open cracks, gaps, voids, bumps, etc. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at all unprotected edges of flooring, unless otherwise shown.
- B. Edge Reducer: Install aluminum threshold edge reducer at existing porcelain tile transition to vinyl composition tile.

3.4 CLEANING AND PROTECTION

- A. Perform cleaning and protection operations immediately after completing the base installation
- B. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.

END OF SECTION

SECTION 09670

RESINOUS FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for Apparatus Bay resinous flooring system with epoxy body.

- 1. Application Method: Metal, power or hand troweled.

1.2 SUBMITTALS

- A. Submit product data for each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. For each resinous flooring system required submit, 6 inches square, applied to a rigid backing by installer for this Project.
- C. Submit Product Schedule using resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.
- D. Submit Installer Certificates signed by manufacturer certifying that installers comply with specified requirements.
- E. Submit Maintenance Data for resinous flooring to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Conduct a pre-installation meeting with the contractor, architect, manufacturer representative, and installer present a minimum of thirty (30) days prior to starting work of this Section.
- B. Installation must be performed by a manufacturer approved contractor with skilled mechanics having not less than three (3) years satisfactory experience in the installation of the type of system as specified in this section, and must be approved in writing by the manufacturer of the Resinous Flooring System.
- C. Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Resinous flooring manufacture shall retain the services of Field Technical

Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 48-inch square floor area selected by Architect.
 2. Include 48-inch length of integral cove base.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on-site weighing or volumetric measurements permitted.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 1. Maintain material and substrate temperature between 65 and 85 deg during resinous flooring application and for not less than 24 hours after application.
 2. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
 3. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

4. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.6 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with submittals.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Stonhard, Inc.
 1. System: Stonclad GS with top coat Stonkote GS4 and Stonseal ST6.
 2. Other manufacturers may be acceptable upon submittal of substantiating data showing conformance with the requirements of this Section and approval by the Architect.
- B. System Characteristics:
 1. Color and Pattern: To be selected by Architect from manufacturer's standards.
 2. Wearing Surface: Standard finish.
 3. Integral Cove Base: TBD inches.
 4. Overall System Thickness: 3/16 inch
- C. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 1. Primer:
 - a. Material Design Basis: Stonhard Standard Primer
 - b. Resin: Bisphenol-A epoxy
 - c. Formulation Description: 100% solids
 - d. Application Method: squeegee and backroll
 - e. Number of Coats: one

2. Mortar Base:
 - a. Material design basis: Stonclad GS
 - b. Resin: Epoxy.
 - c. Formulation Description: 100 percent solids.
 - d. Application Method: Metal Trowel.
 - 1) Thickness of Coats: 3/16 inch.
 - 2) Number of Coats: One.
 - e. Aggregates: Pigmented Blended aggregate.
3. Top Coat:
 - a. Material design basis: Stonkote GS4
 - b. Resin: Bisphenol A epoxy coating.
 - c. Formulation description: 100% solids.
 - d. Type: pigmented.
 - e. Colors: Multiple; as defined on finish schedule for traffic areas.
 - f. Finish: Stonclad Texture #2 or #3
 - g. Number of Coats: one.
4. Seal Coat: Chemical and UV resistant
 - a. Material design basis: Stonseal ST6
 - b. Resin: aliphatic polyurethane/polyurea
 - c. Formulation description: high solids
 - d. Type: clear, gloss
 - e. Finish: standard
 - f. Number of coats: one

2.2 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
Allowances to be made for Stonset QS5 and Stonclad GS

- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Installation contractor shall thoroughly examine existing conditions and report any issues that may be problematic to a proper installation. Do not install product until said issues are resolved to the installers satisfaction.

3.2 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 - 3. Verify that concrete substrates are dry.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab in 24 hours.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.3 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Manufacturer's mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.
 1. Integral Cove Base: 6 inches high
- D. Apply metal trowel single mortar coat in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.
- E. Apply topcoat(s) in number of coats indicated for flooring system. Use spreading

rates recommended in writing by manufacturer.

- F. Apply sealer coat(s) in number of coats indicated for flooring system. Use spreading rates recommended in writing by manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Material Sampling: Architect may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for decorative resinous flooring system with epoxy body.

- 1. Application Method: Squeegee, screed, and broadcast.

1.2 SUBMITTALS

- A. Submit product data for each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. For each resinous flooring system required submit, 6 inches square, applied to a rigid backing by installer for this Project.
- C. Submit Product Schedule using resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.
- D. Submit Installer Certificates signed by manufacturer certifying that installers comply with specified requirements.
- E. Submit Maintenance Data for resinous flooring to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Conduct a pre-installation meeting with the contractor, architect, manufacturer representative, and installer present a minimum of thirty (30) days prior to starting work of this Section.
- B. Installation must be performed by a manufacturer approved contractor with skilled mechanics having not less than three (3) years satisfactory experience in the installation of the type of system as specified in this section, and must be approved in writing by the manufacturer of the Resinous Flooring System.
- C. Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Resinous flooring manufacture shall retain the services of Field Technical

Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 48-inch square floor area selected by Architect.
 2. Include 48-inch length of integral cove base.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on-site weighing or volumetric measurements permitted.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 1. Maintain material and substrate temperature between 65 and 85 deg during resinous flooring application and for not less than 24 hours after application.
 2. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
 3. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

4. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.6 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with submittals.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Stonhard, Inc.
 1. System: Stontec ERF.
 2. Other manufacturers may be acceptable upon submittal of substantiating data showing conformance with the requirements of this Section and approval by the Architect.
- B. System Characteristics:
 1. Color and Pattern: To be selected by Architect from manufacturer's standards.
 2. Wearing Surface: Slip resistant texture.
 3. Integral Cove Base: 4 inches.
 4. Overall System Thickness: 2mm
- C. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 1. Primer:
 - a. Material Design Basis: Stonhard Standard Primer
 - b. Resin: Epoxy
 - c. Formulation Description: (2) two component 100 percent solids
 - d. Application Method: squeegee and roller
 - e. Number of Coats: one

- f. Aggregates: Broadcast quartz into wet primer coat.
- 2. Body Coat(s):
 - a. Material Basis: Stontec Undercoat.
 - b. Resin: Epoxy.
 - c. Formulation Description: (3) three component solvent free epoxy.
 - d. Application Method: Notched squeegee.
 - 1) Thickness of Coats: 25-30 mils with standard primer coat
 - 2) Number of Coats: (1) One.
- 3. Broadcast:
 - a. Material Basis: Stontec Flakes
 - b. Formulation Description: Decorative flake (1/32 inch; 1/16 inch or 1/4 inch)
 - c. Type: Tweed (chips to be pre-mixed in Manufacturer's facility)
 - d. Finish: Broadcast to rejection.
 - e. Number of Coats: one.
- 4. Top Coat:
 - a. Material: Stonkote GS4
 - b. Resin: Epoxy.
 - c. Formulation Description: (2) component, UV stable, solvent free epoxy.
 - d. Type: Clear gloss.
 - e. Finish: Texture #2 for slip resistance (optional; wet areas).
 - f. Number of Coats: two

2.2 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
Allowances to be made for Stonset QS5 and Stonclad GS
- B. Joint Sealant: Type recommended or produced by resinous flooring

manufacturer for type of service and joint condition indicated. Provide Stonflex MP7 joint fill material and CT5 concrete crack treatment at locations required or recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Installation contractor shall thoroughly examine existing conditions and report any issues that may be problematic to a proper installation. Do not install product until said issues are resolved to the installers satisfaction.

3.2 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:

- a. Mechanically prepare with the use of Diamond grinding equipment to provide surface sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
- b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.

- a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
- b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab in 24 hours.
- c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous

flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.3 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates
- C. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners. Refer to detail drawings.
- E. Body coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

- F. Broadcast: Immediately broadcast decorative flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- G. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
- H. Second sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.4 TERMINATIONS

- A. Chase edges to "lock" the coating system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the coating to lock in place at point of termination.

3.5 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.6 FIELD QUALITY CONTROL

- A. Material Sampling: Architect may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using

testing procedures listed in manufacturer's product data.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.7 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for textile composite flooring modules as indicated on the drawings.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings including plans, elevations, and details indicating full extent of work.
- C. Submit two (2) finished samples approximately 7 inches x 7 inches of the exact type of flooring proposed, including quality, pattern, color, and backing.
- D. Submit installer qualifications including references.
- E. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required flammability tests as well as other testing requirements of this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer shall be ISO 14001 certified and have a minimum of 20 years experience in the manufacture of commercial flooring.
- B. Installation standards shall be as listed in The Carpet and Rug Institute's Standard for Installation of Commercial Carpet CRI-104, and shall establish the minimum installation procedures.
- C. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated to receive textile composite flooring modules.
- D. Flooring contractor shall specialize in commercial flooring and carpet installation. The firm or individual shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI). Flooring contractor shall be a specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in commercial installation of similar flooring materials and participation in manufacturer's environmental program including responsible flooring removal, recycling, and installation.
- E. Manufacturer shall offer a reclamation program for the recycling of existing broadloom carpet, modular carpet tile and textile composite flooring.

- F. Manufacturer shall provide field service experts to assist in project start-up as required by the job and will notify owner, architect, general contractor, or another designated contact if any installation instructions are not followed.
- G. Conduct a pre-installation meeting a minimum of two (2) weeks prior to installation to include the contractor, installer, and architect.
- H. Prepare a minimum 10 foot x 10 foot mock-up installation indicating typical conditions of installation for entire project. Mock-up may be incorporated into the work upon approval. Protect mock-up from damage until completion of work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials to the site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions, and related information.
- B. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor and/or the manufacturer.
- C. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified by manufacturer's installation instructions.
- D. All materials, including adhesives, shall be delivered to the site a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Place pallets of textile composite flooring modules on a flat surface (do not double stack pallets). After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the flooring manufacturer's installation instructions and shall also include sufficient heat, light, and power required for effective and efficient working condition.
- E. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the modules within the installation area and allow them to precondition for 48 hours prior to installation. Module installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved, and completed. Traffic shall be closed during the installation of the textile composite flooring products. Verify concrete slabs are dry in accordance with the standards for bond and moisture tests listed in the manufacturer's installation instructions.

1.5 WARRANTY

- A. Warranties must be issued by the manufacturer as standard published warranties on all types of flooring modules within this document. Second source warranties that involve parties other than the textile composite flooring manufacturer are unacceptable. If the product fails to perform as warranted when installed according to the manufacturer's installation instructions and maintained according to manufacturer's maintenance instructions, the affected area shall be repaired or replaced at the expense of the manufacturer. Manufacturer shall provide standard published written performance warranties for the following:
1. Lifetime product performance. Excessive wear means no more than five percent (5%) loss of pile fiber weight.
 2. Lifetime static protection, meaning built-in protection below 3.0 kv as tested under AATCC-134.
 3. Lifetime Stain Removal
 4. Lifetime Colorfastness (Light and Crocking)
 5. Lifetime Edge Ravel
 6. Lifetime Delamination
 7. Lifetime Dimensional Stability
- B. Flooring contractor shall provide Owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of no less than two (2) years after job completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Kinetex, a brand of J+J Flooring Group, P.O. Box 1287, Dalton, GA, 30722. Tel: 800-241-4586. Web: jj-kinetex.com
- B. Equal products of other manufacturer's may be acceptable upon strict compliance with the requirements of this Section and approval by the architect.

2.2 MATERIALS

- A. Kinetex flooring modules (tiles):
1. Product: Propel
 2. Color: See Section 09050 - Color Design..
 3. Backing: Polyester Cushion Felt
 4. Dye Method: Solution Dyed

5. Fiber Type: Polyester
6. Total Weight (Nominal Average): 4.5 oz - 5.2 ounce per square foot
7. Pattern Repeat: N/A
8. Soil Release: Yes
9. Standard Size: 24 inches x 24 inches (approximate)
10. Testing Specifications - Smoke Density: Less than 450 flaming (ASTM E 662)
11. Testing Specifications - Static Test: Less than 3 kv (AATCC-134)
12. Recycled content: Minimum of 50% recycled content
13. NSF/ANSI 140 Platinum Certified
14. Closed-loop recyclable

2.3 ADHESIVES

- A. Manufacturer's pressure-sensitive adhesive designed for the installation of textile composite flooring modules.

2.4 ACCESSORIES

- A. Protective transition 3/16-inch to other floor covering thickness. Provide transition/reducing strips tapered to meet abutting materials as indicated in the drawings.
- B. Provide aluminum edge with lip to protect textile composite flooring edges.

2.5 PERFORMANCE DATA

- A. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:
 1. Pill Test / DOC-FF-1-70 (ASTM D-2589) - Requirement: Pass
 2. Flooring Radiant Panel / ASTM E-648 - Requirement: Class I (Above .45 w/cm)
 3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus Test.
 4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 16E.

5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.
6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.
7. Noise Reduction Coefficient (ASTM C 423-02): NRC Rating of 0.30
8. Impact Insulation Classification (ASTM E 492-09): IIC Rating of 64

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive installation of modules.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive installation of modules.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits as recommended by textile composite flooring manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.
- F. Textile composite flooring shall be inspected by installer prior to installation for proper style, color and potential defects. Textile composite flooring shall not be installed with visible defects.

3.2 PREPARATION

- A. Surface Preparation: Dust, dirt, debris and non-compatible adhesive must be removed before the installation begins. Surfaces must be smooth and level with all holes and cracks filled with Portland cement-based patch reinforced with polymers. Adhesive shall not be applied to any substrate where chemical or solvent-based cleaners have been used.
- B. Latex Adhesives: Old latex adhesives must be mechanically scraped down to a bare residue. Latex adhesive residues must be smooth and level with all holes and cracks filled with a Portland cement-based patch reinforced with polymers, or encapsulated with sealer as recommended by manufacturer.
- C. Cut Back Adhesives: Must be wet mechanically scraped to a minimum residue and encapsulated with sealer as recommended by manufacturer.

- D. Concrete Moisture Testing and pH Testing: Substrate surfaces must be tested for moisture emission. It is the responsibility the installer to perform moisture testing prior to starting the installation. ASTM-F 2170-2 relative humidity probe moisture testing is required. Acceptable relative humidity probe testing results are up to 95% RH. Alkalinity tests should also be performed per ASTM F 710. The maximum acceptable pH is 9.0.
- E. Subfloor
 - 1. New Concrete - New concrete must be fully cured and free of moisture (see ASTM F 710). New concrete requires a curing period of approximately 90 days.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install flooring in strict accordance with the finish drawings and manufacturer's installation instructions.
- C. A full spread adhesive system shall be required for flooring modules. The spread rate shall be in strict accordance with manufacturer's printed installation instructions. Allow to dry until transparent or adhesive does not transfer to finger when touched. Drying time will vary with temperature, humidity and air velocity, however modules must be installed within two hours after adhesive has dried.
- D. Module Placement: Arrows shall be printed on the module backing to show pile/machine direction. A tight installation without compression is mandatory for optimum performance and appearance of the modular installation. It is critical that each module uniformly touch each adjoining module without a gap. To ensure a clean tight fit, do not pull/tug or slid-in modules, but instead lay each module into its location against the adjoining module. Press/form the module into place where the new module meets the previously installed module. A quarter turn install method is required.
- E. Pallet and Bundle Sequencing: Install modules in the order they were manufactured by selecting pallets in sequential order and following the numbers located on each bundle of modules. Installation shall begin with the lowest bundle numbers and progress through the highest numbers until the project is complete. Installing modules by bundle sequence will assure the most even uniform look possible.
- F. Completing Installation: To avoid dislodging modules, do not walk on or move furniture onto modules until the area is completely anchored. Roll entire area with 75-100 lb. roller in both directions (north-south and east-west) after completion of installation. It is also required that sheets of plywood or hardboard be laid over the new modular surface when transporting heavy furniture on carts or dollies. As a final step, vacuum the entire area with an upright vacuum.
- G. Install accessories as required by drawings and in accordance with manufacturer's specifications.

3.4 CLEANING AND PROTECTING

- A. Use a moist cloth when wet; if dry, use a solvent based product applied to a towel then worked onto the module for removal of contaminants such as adhesive, paint, oil and grease.
- B. Follow manufacturer's maintenance guidelines.
- C. Clean and vacuum surfaces.
- D. Protect from damage until final acceptance.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SUMMARY

- A. The extent of painting work is shown on the drawings, schedules and in this Section. The work includes painting and finishing of exterior and interior exposed items and surfaces throughout the project except as otherwise indicated. Surface preparation, priming and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections of the work.
- B. The work includes field painting of interior drywall, cmu, metal doors, frames, interior and exterior wood trim, miscellaneous and structural steel and other surfaces.
- C. Paint, as used in this Section, means all coating system materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats
- D. Paint all exposed surfaces whether or not colors are designated in the Finish Schedules, except where the natural finish of the material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the Architect will select these from standard colors available for the materials system specified.

1.2 PAINTING NOT INCLUDED

- A. Shop Priming: Shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal, hollow metal work, fabricated or factory-built mechanical and electrical equipment or accessories and similar items, unless otherwise specified. All ferrous metals not shop primed shall be painted.
- B. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, doors, finished mechanical and electrical equipment including light fixtures, switch-gear and distribution cabinets, elevator entrance frames, door and equipment and other prefinished items and materials.
- C. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaced, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
- D. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting unless otherwise indicated.
- E. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- F. Labels: Do not paint over any code-required labels, such as Underwriter's

Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.3 SUBMITTALS

- A. Submit applicator/contractor qualifications and experience record including list of successfully completed projects of similar size and scope of the work of this project.
- B. Submit paint manufacturer's technical information, product data, material safety data sheets, test data, and instructions for handling, storing and applying each coating. Submit manufacturer's technical information, product data, material safety data sheets, and instructions for handling, storing and applying cleaners, thinners, additives and other related painting materials. Each page shall be labeled to indicate which paint system it is in reference to.
- C. Submit manufacturer's color selection chips for preliminary color selections.
- D. Submit painting color samples on 1 foot square pieces of actual materials to which paint will be applied for final approval of color.
- E. Submit manufacturer's cleaning and preparation instructions for each type of previously painted surface to receive paint finish.
- F. Submit cleaning and preparation instructions for galvanized surfaces to receive paint finish.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The paint manufacturer shall have a minimum of ten (10) years experience in manufacturing the products of this section. The paint manufacturer shall be a member of the National Paint and Coatings Association. Manufacturer shall have in house testing to verify quality and performance of products manufactured.
- B. Applicator Qualifications: The applicator/subcontractor shall have a minimum of ten (10) years experience in the application of paints and related products similar in size and scope to the work of this project.
- C. Materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute.
- D. The applicator /subcontractor shall employ skilled workmen experienced in application of paints specified in this section and shall employ the use of modern equipment and techniques in accomplishing the work.
- E. Duplicate specified painted finishes on actual wall surfaces and other exterior and interior building components. Provide full-coat finish mock-up on at least 100 square feet of wall surface indicating required sheen, color and texture. Simulate finished lighting conditions for review of in-place work.
- F. Architect shall be notified upon the completion of priming coat on galvanized steel surfaces and allowed to view surfaces prior to the application of finish coats.

1.5 PRE-PAINTING CONFERENCE

- A. Approximately two weeks prior to scheduled commencement of painting work, meet at project site to discuss conformance with requirements of specification

and job site conditions. Representatives of architect, general contractor, painting subcontractor, and other parties who are involved in the scope of this installation shall attend the meeting. Review submittals, preparation of surfaces, specific concerns related to site, and other items as may be required to ensure proper execution of the work.

1.6 DELIVERY AND STORAGE

- A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Name or title of material
 - 2. Federal Specification number, if applicable
 - 3. Manufacturer's stock number and date of manufacture
 - 4. Manufacturer's name
 - 5. Contents by volume, for major pigment and vehicle constituents
 - 6. Thinning instructions
 - 7. Application instructions
 - 8. Color name and number

1.7 JOB CONDITIONS

- A. Apply paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- B. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent. Do not apply paint to damp or wet surfaces unless otherwise permitted by the paint manufacturer's printed instruction. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 COLORS AND FINISHES

- A. Paint colors, surface treatments, and finishes are indicated in the Finish Schedules and in Section 09050 - Color Design. Use representative colors when preparing samples for review. Final acceptance of colors will be from samples.
- B. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated. Lead content in the pigment is not permitted
- C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coats system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials provided for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primer or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified

coating systems with substrates primed by others.

2.2 MATERIAL QUALITY

- A. Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide undercoat paint produced by the same manufacturer as the finish coats.
- C. Use only thinners approved by the paint manufacturer and use only within recommended limits.

2.3 MANUFACTURER

- A. Benjamin Moore products are indicated to establish the minimum acceptable quality for paint materials. Equal products of other manufacturers are acceptable upon compliance with the provisions of this Section and approval by Architect. Provide a written certification from the paint manufacturer that materials provided meet or exceed the specified products.

2.4 PAINT SYSTEMS

- A. Provide exterior paint systems for the following substrates:
 - 1. Ferrous Metal
 - a. 1st Coat - P06 Alkyd Metal Primer, red
 - b. 2nd Coat - P29 Acrylic Semi-gloss Enamel
 - c. 3rd Coat - P29 Acrylic Semi-gloss Enamel
 - 2. Shop Primed Metal
 - a. 1st Coat - Touch-up Primer 163 Alkyd Primer
 - b. 2nd Coat - P29 Acrylic Semi-gloss Enamel
 - c. 3rd Coat - P29 Acrylic Semi-gloss Enamel
 - 3. Zinc Coated Metal
 - a. 1st Coat - P04 Acrylic Metal Primer
 - b. 2nd Coat - P29 Acrylic Semi-gloss Enamel
 - c. 3rd Coat - P29 Acrylic Semi-gloss Enamel
- B. Provide interior paint systems for the following substrates:
 - 1. Gypsum Drywall
 - a. 1st Coat - 253 Latex Primer Undercoat
 - b. 2nd Coat - N538 Ultra Spec 500 Eggshell
 - c. 3rd Coat - N538 Ultra Spec 500 Eggshell

2. Gypsum Drywall in Wet Areas
 - a. 1st Coat - N023 Fresh Start Acrylic Primer
 - b. 2nd Coat - V341 Waterborne Pre-catalyzed Epoxy
 - c. 3rd Coat - V341 Waterborne Pre-catalyzed Epoxy
3. Ferrous Metal
 - a. 1st Coat - P06 Alkyd Metal Primer, red
 - b. 2nd Coat - P29 Acrylic Semi-gloss Enamel
 - c. 3rd Coat - P29 Acrylic Semi-gloss Enamel
4. Shop Primed Metal
 - a. 1st Coat - Touch-up Primer P06 Alkyd Primer
 - b. 2nd Coat - P29 Acrylic Semi-gloss Enamel
 - c. 3rd Coat - P29 Acrylic Semi-gloss Enamel
5. Concrete Floors, Opaque Finish
 - a. 1st Coat - N122 Floor and Patio Enamel
 - b. 2nd Coat - N122 Floor and Patio Enamel

PART 3 EXECUTION

3.1 INSPECTION

- A. Applicator must examine the areas and conditions under which painting work is to be applied and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator. Starting of painting work will be construed as the Applicator's acceptance of the surfaces and conditions within any particular area.
- B. Test all previously painted surfaces with denatured alcohol to determine whether existing coating is oil or water base. Rub the surface with a clean cloth or rag saturated with denatured alcohol. If the surface begins to come off and becomes tacky, the surface is water base. If the denatured alcohol just cleans the surface, the surface is an oil base or alkyd coating.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.2 SURFACE PREPARATION

- A. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as specified for each particular substrate condition. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place that are not to be finish painted. Following completion of painting of each space or area, and only when painting is completely dry and will not adhere to removed items, reinstall the removed items by workmen skilled in the trades involved. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease

prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

- B. Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of the priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dry.
- C. Prime, stain, or seal wood required to be job-painted, immediately upon delivery to job. Prime edges, ends, faces, under sides, and backsides of such wood, including cabinets, counters, cases, paneling, etc. When transparent finish is required, use spar varnish for back priming. Seal tops, bottoms, and cut-outs of un-primed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.
- D. Back prime and seal all exterior wood trim prior to installation.
- E. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning. Touch-up shop-applied prime coats wherever damaged or bare, and where required by other sections of these specifications. Clean and touch-up with the same type shop primer.
- F. Clean and profile galvanized steel surfaces to receive a painted finish in accordance with the recommendations of the American Galvanizers Association. Galvanized surfaces shall be free of oil and surface contaminants.
- G. Previously Painted Surfaces: Remove loose paint and scale. Thoroughly clean surfaces in strict accordance with paint manufacturer's instructions.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.4 APPLICATION

- A. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the substrate and type of material being applied. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- B. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint. Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.

- C. Finish exterior doors on tops, bottoms and side edges the same as the exterior faces, unless otherwise indicated.
- D. Sand lightly between each succeeding enamel or varnish coat.
- E. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- F. Scheduling Painting: Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- G. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- H. Paint all items in equipment rooms and those exposed in occupied spaces. Items to be painted include but are not limited to the following:
 - 1. Piping, pipe hangers, and supports
 - 2. Heat exchangers
 - 3. Tanks
 - 4. Ductwork, insulation
 - 5. Motor, mechanical equipment and supports
 - 6. Accessory items
 - 7. Conduit and fittings
 - 8. Switchgear
- I. Prime Coats: Apply a prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing
- J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
- L. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

- M. Smoke partitions, fire and smoke partitions, smoke barriers, fire and smoke barriers shown or designated shall be effectively and permanently identified with a painted sign either by stenciling or approved permanently attached applique, located above ceilings and in concealed spaces. Wording shall be painted red letters approximately 2 inches high on white background. Locate top edge of sign approximately one foot down from top of wall where it is visible from floor and at a maximum spacing of 10'-0" o.c. on each side of all walls, at each intersecting wall, and as directed by Architect. Where exposed ceilings occur verify locations with Architect prior to installation. Wording shall be in all capital letters as follows with rating inserted in the ____ as indicated on the drawings for each type and rating:
1. At all fire rated partitions: ____ RATED FIRE PARTITION - PROTECT ALL OPENINGS
 2. At all fire and smoke barriers: ____ RATED FIRE AND SMOKE BARRIER-PROTECT ALL OPENINGS
 3. At all fire barriers: ____ RATED FIRE BARRIER-PROTECT ALL OPENINGS
 4. At smoke barriers: ____ SMOKE BARRIER-PROTECT ALL OPENINGS
 5. At rated smoke partitions: ____ SMOKE PARTITION-PROTECT ALL OPENINGS
 6. At non-rated smoke partitions: SMOKE PARTITION-SEAL ALL PENETRATIONS
- N. Temporary Room Identification: Identify all rooms and spaces as soon as practicable with temporary painted letters, in white or other approved contrasting color, approximately 2 inches high. Locate on the concrete floor slab at the door entrance way to each room or space. Text to include room name and number as identified in the contract documents.

3.5 CLEAN-UP AND PROTECTION

- A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day. Upon completion of painting work, clean window glass and other paint-spattered surfaces, drips, over spray, etc. Remove paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by others for protection of their work, after completion of painting operations. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for fiberglass reinforced plastic wall panels and related trim.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 2. ASTM D5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 - 3. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- C. Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
- D. Submit selection and verification samples for finishes, colors and textures. Submit two (2) samples of each type of panel, trim and fastener.
- E. Submit shop drawings indicating wall panel layout. Include plans, elevations and details showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns, textures and connections to adjoining work. Indicate location and dimension of joints and fastener attachment.
- F. Submit installer qualifications.

1.4 QUALITY ASSURANCE

- A. Conduct a preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

- B. Installer shall have a minimum of two (2) years experience in the installation of wall panels similar in size and scope to the work of this project.
- C. Manufacturer shall be capable of providing field service representation during construction and shall be capable of approving application method.
- D. Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, texture, pattern and workmanship standards. Mock-up may be incorporated into work.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to project site.
- B. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels indoors in a dry place at the project site.
- C. Remove foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture has dissipated.
 - 2. Maintain a constant minimum temperature of not less than 60 degrees F. in installation areas for at least 72 hours before installation, and until substantial completion.
 - 3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide products as manufactured by or equal to Crane Composites, Inc. 23525 West Eames Street, Channahon, IL 60410.
Tel: 815-467-8600 Web: www.glasbord.com

2.2 MATERIALS

- A. Kemlite Fire-X Embossed Glasbord Fiberglass Panels with Surfaseal surface protection.
 - 1. Rating:
 - a. Fire-X Glasbord Underwriters Laboratories, Inc. (UL) classified, Class I (A) Interior Finish Material.
 - b. Fire-X Glasbord FM Class I (A) Interior Finish Material, Factory Mutual approved per Standard 4880, Test Report 2B2A2.AM.
 - 2. Performance Properties: Provide products with the following properties:
 - a. Underwriters Laboratories, Inc. (UL), Classified.
 - b. Class A flamespread of less than 25, smoke developed less than 450 per ASTM E84 latest version.
 - c. Barcol Hardness (scratch resistance) of 55 as per ASTM D2583.
 - d. Panels will exhibit no more than a 0.038 percent weight loss after a 25 cycle Taber Abrasion Test using CS-17 abrasive wheels with 1000 g weight.
 - e. Gardner Impact Strength of 40 in-lb showing no visible damage on front side per ASTM D5420.
 - f. FMRC (Factory Mutual Research Corporation)
 - g. Meets USDA/FSIS requirements.
 - h. Complies with ICBO Report Number 4583.

2.3 ACCESSORIES

- A. Sealant: Provide sealant to match panel color.
- B. Provide panel adhesive as recommended by panel manufacturer.

2.4 COLOR

- A. Submit product samples to include full range of manufacturer's colors for selection by Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which wall panels are to

be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work

1. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails are countersunk and joints and cracks are filled flush and smooth with the adjoining surface.
- B. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer. Install specified materials only when normal temperature and humidity conditions approximate the interior conditions that will exist when the building is occupied.

3.2 PREPARATION

- A. Remove materials from packaging and allow to acclimatize to the area of installation 24 hours before application. Remove or protect all areas and items not scheduled to receive wall panels before priming and sealing of substrates where wall panels are to be applied. Prime and seal substrates in accordance with the panel manufacturer's printed recommendations for the type of substrate material to be covered.

3.3 INSTALLATION

- A. Install wall panels butt jointed with sealed joints (no trim) in accordance with the manufacturer's printed instructions for application of the panels over the installed substrate.
- B. Wall panel patterns shall be centered in each partition receiving panels with no panel less than two feet in width unless indicated otherwise. Height shall full height of wall or as indicated on drawings.
- C. Install caulking to provide a neat and uniform appearance. Caulking shall match color of panel, be approved by the manufacturer of the panels, and comply with Section 07900 - Caulking and Sealants.

3.4 CLEANUP

- A. Upon completion of work, remove surplus materials, rubbish and debris resulting from wall panel installation and leave areas of work in a neat, clean condition.
- B. Remove any excess adhesive or sealant from wall panels or surrounding surfaces with a solvent or cleaner recommended by the panel manufacturer.

END OF SECTION

SECTION 10100

VISUAL COMMUNICATION BOARDS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for visual communication board and related accessories and tackboard. The extent and type of visual communication boards are shown on drawings. The types of visual communication boards in this Section are:

1. LCS Marker board.
2. Tackboard.

1.2 QUALITY ASSURANCE

- A. Furnish all visual communications boards by one manufacturer for entire project unless indicated otherwise.
- B. Provide tackboard surfaces which have been tested in accordance with ASTM E-84 and have been certified as complying with the following fire hazard classifications:
 1. Flame spread not more than 25
 2. Fuel contributed not more than 25
 3. Smoke developed not more than 25.
- C. Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

1.3 SUBMITTALS

- A. Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.
- B. Submit full range of color samples for each type of visual communications board, surface, trim and accessories required. Provide 12 inch square samples of sheet materials and 12 inch lengths of trim members for color verification after selections have been made.
- C. Submit shop drawings for each type of visual communication board. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.

- D. Submit manufacturer's certification that all materials furnished for project comply with requirements specified herein.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide products as manufactured by Claridge or equal.

2.2 LCS MARKER BOARDS

- A. Markerboards: Equal to Model TL2034-MLC
 - 1. Provide one set of markers and eraser.

2.3 TACKBOARDS

- A. Tack Board: Model 852F with KE592 Gentleman Gray Fabric

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which units are to be installed and must notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

- A. Deliver factory-built units completely assembled in one piece without joints, whenever possible. When overall dimensions require delivery in separate units, prefit at factory, disassemble for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.
- B. Install units in location and mounting heights as shown on drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb, and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories for complete installation.
- C. Coordinate job-assembled units with grounds, trim, and accessories. Join all parts with neat, precision fit.

3.3 ADJUST AND CLEAN

- A. Verify that accessories required for each unit are properly installed and operating units are properly functioning.
- B. Clean units in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for solid plastic toilet partitions doors and including manufacturer's standard stainless steel fittings, hardware, and accessories.

1.2 SUBMITTALS

- A. Submit details of construction relative to materials, fabrication, and installation for each type of screen and compartment. Include details of anchors, hardware, and fastenings.
- B. Submit shop drawings for fabrication and installation of toilet compartment and screen assemblies including plans, elevations, sections, details, and attachments to other work. Show locations of reinforcement.
- C. Submit manufacturers cleaning and maintenance instructions, including a recommended list of cleaning products to be used. Include precautions against materials and methods which may be detrimental to finishes. Clearly annotate any type of cleaning solution or method that should not be used or will cause damage to the product.
- D. Submit samples of each compartment or screen color and finish prepared on 6 inch square of the same thickness and material indicated for Work.

1.3 QUALITY ASSURANCE

- A. Toilet partition manufacturer shall have a minimum of ten (10) years experience in the manufacture of products similar to the products specified for this project.
- B. Toilet partition installer shall have a minimum of five (5) years experience in the installation of toilet partitions related support structure similar in size and scope of the work of this project.

1.4 PROJECT CONDITIONS

- A. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. . Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.5 WARRANTY

- A. Provide manufacturer's 25 year warranty against breakage and corrosion under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Scranton Products Inc., 801 East Corey Street, Scranton, PA 18505.
Tel: 800-445-5148 Web: scrantonproducts.com
 - 1. Style: Solid Plastic Toilet Compartments
 - 2. Height: Standard, 55 inches
- B. Products of other manufacturer's offering the same quality, materials, construction, assembly, color, and texture may be acceptable upon submission of data substantiating conformance to this specification section and approval by the Architect.

2.2 MATERIALS

- A. Doors, Panels and Pilasters:
 - 1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
 - 2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
 - 3. 1 inch thick with edges rounded to 1/4 inch radius.
 - 4. Fire hazard classification: Class A (0-25) flame spread/smoke developed rating, tested to ASTM E84.
 - 5. Color: Black with Hammered finish
- B. Stainless steel: ASTM A 666, Type 304, with a number 4 finish.
- C. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

2.3 HARDWARE

- A. Hinges: Continuous stainless steel helix
- B. Shoes: 20 gage stainless steel
- C. Brackets: Provide manufacturer's standard continuous stainless steel brackets at toilet compartments and urinal screens.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel 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.

2.4 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Provide manufacturer's standard corrosion-resistant supports and fasteners.
- C. Doors: Unless otherwise indicated, provide 24 inch wide in-swinging doors.
 - 1. Hinges: Manufacturer's standard stainless steel continuous hinge, self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
 - 2. Latch and Keeper: Recessed latch unit, with 'in-use' indicator, designed for emergency access, with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 - 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 - 4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
 - 5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 EXECUTION

3.1 INSPECTION

- A. Investigate areas where partitions and screens are to be installed to ensure that all wood blocking, anchor plates and metal stud support assemblies are in place for the support of toilet compartments and screens. Report any discrepancies or inadequate conditions for secure support of work of this section or conditions that would impair the proper performance of the screens and partitions and do not proceed with installation until condition is corrected.
- B. Verify completion of finishes to be applied to walls and floors before proceeding.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

- B. Secure pilasters to supporting structure and level, plumb, and tighten.
- C. Attach screens and partitions to continuous blocking concealed in walls with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact. Blocking shall be continuous for the full length and width of items to be anchored and shall provide sufficient strength to resist all applied forces.

3.3 ADJUSTING AND CLEANING

- A. Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 10200

LOUVERS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for exterior louvers.
- B. The extent of louvers and vents is indicated on the drawings including indications of sizes and locations.
- C. See Section 08950 - Insulated Translucent Wall System for louvers integral with system.

1.2 QUALITY ASSURANCE

- A. Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500L-99. Louvers shall be licensed to bear AMCA Certified Ratings Seal.
- B. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.
- C. Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit certified test data for each type and size of louver indicated.
- C. Submit shop drawings for the fabrication, installation and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.
- D. Submit 6 inch square samples of each required finish. Prepare samples on metal of same gage and alloy to be used in work. Where normal color and texture variations are to be expected, include two or more units in each sample showing limits of such variations.

PART 2 PRODUCTS

2.1 LOUVERS

- A. Provide Model A6097H as manufactured by Construction Specialties, Inc. or equal products of one of the following:
 - 1. The All-Lite Co.
 - 2. Ruskin
- B. Materials:
 - 1. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to provide required finish.
 - 2. Aluminum Extrusions: ASTM B 221, Alloy 6063-T52.
 - 3. Finish: Kynar: 2-coat 70% Kynar 500/Hylar 5000 in color to be selected.
 - 4. Fastenings: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gages, and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
 - 5. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
 - 6. Bituminous Paint: Conform to SSPC-PS 9.01 cold-applied asphalt mastic painting system with extra-thick film.
- C. Fabrication
 - 1. Frame:
 - a. Material: Extruded aluminum, Alloy 6063-T5.
 - b. Wall Thickness: 0.125 inch, nominal.
 - c. Depth: 6 inches.
 - d. Downspouts and caulking surfaces.
 - 2. Blades:
 - a. Style: Drainable.

- b. Material: Extruded aluminum, Alloy 6063-T5.
 - c. Wall Thickness: 0.125 inch, nominal.
 - d. Angle: 37.5 degrees.
 - e. Centers: 5-29/32 inches, nominal.
3. Bird Screen:
- a. Material: Aluminum 1/2 inch x 0.063 inch diameter aluminum mesh
 - b. Frame: Removable, rewireable.
4. Insect screen:
- a. Material: 18 x 16 aluminum mesh, mill finish.
5. Gutters: Drain gutter in head frame and each blade.
6. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
7. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches.
8. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture.
9. Blank-off panels: 0.040 aluminum sheet, factory installed with removable screws and neoprene gaskets.
10. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.
11. Include supports, anchorages, and accessories required for complete assembly.
12. Provide horizontal mullions at horizontal joints between louver units except where continuous vertical assemblies are indicated.
13. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Performance data

1. Free Area: 52.1 percent for a 48 inch x 48 inch size.
2. Free Area Size: 8.34 square feet.
3. Maximum Recommended Air Flow Thru Free Area: 990 feet per minute.
4. Air Flow: 8256 cubic feet per minute.
5. Maximum Pressure Drop: 0.16 inches.
6. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/m^2) of free area at an air flow of 1,023 feet per minute (312 m/min) free area velocity when tested for 15 minutes.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION

- A. Locate and place units plumb, level and in proper alignment with adjacent work. Use concealed anchorages wherever possible.
- B. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- C. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations and refinish entire unit, or provide new units, at Contractor's option.
- D. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with contract, masonry or dissimilar metals.
- E. Install sealants as indicated on drawings in accordance with the requirements of Section 07900 - Sealants.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for custom designed, fixed, extruded aluminum equipment screen.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings for the fabrication and installation. Include plans, elevations, details and sections indicating connections to adjoining work. Indicate materials, finishes, fasteners, joinery, hardware and other information to determine compliance with specified requirements.

1.3 QUALITY ASSURANCE

- A. The manufacturer shall have a minimum of ten (10) years experience in the manufacture and fabrication of sun screens similar in design and construction to the work of this project.
- B. The Contractor shall conduct a pre-installation meeting to include the Architect, Owner, and all trades and installations affected by the screen installation.
- C. Coordinate the work of this Section with work specified in Section 10532 - Preengineered Canopies and Walkway Covers.
- D. The installer shall have a minimum of five (5) years experience in the installation of similar installations to the work of this project.

1.4 PROJECT CONDITIONS

- A. Verify actual supporting and adjoining construction by field measurements before fabrication and indicate recorded measurements on final shop drawings. Coordinate construction to ensure that assemblies fit properly to supporting and adjoining construction and coordinate schedule with construction progress to avoid delaying the work.
- B. Where field measurements can not be made without delaying the work, guarantee dimensions and proceed with fabricating of assemblies without field measurements. Coordinate construction to ensure that assemblies correspond to established dimensions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle screen assemblies in accordance with manufacturer's

instructions.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Construction Specialties, Inc, 49 Meeker Avenue, Cranford, New Jersey.
Web: c-sgroup.com Tel: 800.631.7379
- B. Products of other manufacturer's offering the same quality, materials, construction, assembly, color, and texture may be acceptable upon submission of data substantiating conformance to this specification section and approval by the Architect.

2.2 SCREEN

- A. Equal to Paralinear Grille Modular Pattern.
 - 1. Shape and size as indicated on drawings. Horizontal and vertical bar spacing as indicated on drawings.
- B. Bars to be fabricated from extruded aluminum sections in 6063-T52 alloy, and to be minimum .125 inch thick. Blade connections within the grille shall be accomplished by cross lap joints tack welded where required.

2.3 MATERIALS

- A. Aluminum Extrusions: ASTM B221, alloy 6063 –TB or T2
- B. Aluminum sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: As same basic metal and alloy as fastened metal or 300 series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.
- D. Use types and sizes to suit unit installation conditions.
- E. Use Phillips flat head screws for exposed fasteners, unless otherwise indicated.
- F. Anchors and inserts: Of type, size and material required for loading and installation indicated. Use nonferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as needed for corrosion resistance. Use toothed steel or expansion bolt devices for drilled in place anchors.
- G. Bituminous paint: Cold applied asphalt emulsion complying with ASTM D 1187

2.4 FABRICATION

- A. Fabricate architectural screens as detailed on drawings and approved shop

drawings.

- B. Assemble architectural screens in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitation. Clearly mark units for reassembly and coordinated installation.
- C. Maintain equal blade spacing, including separation between blades and frames to produce a uniform appearance.
- D. Include supports, anchorage, and accessories required for complete assembly.

2.5 FINISH

- A. All components shall have a clear anodized finish complying with NAAMM: Metal Finishes Manual for architectural metal products for recommendations for applying and designating finishes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas where architectural screens are to be installed and report any conditions detrimental to the proper installation of the systems. Do not proceed with installation until such conditions are corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 INSTALLATION

- A. Locate and place screen plumb and at indicated alignment with adjacent work.
- B. Use concealed anchorage where possible.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be finished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by applying a heavy coating or bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

3.4 CLEANING AND PROTECTING

- A. Periodically clean exposed surfaces of architectural screens that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap not harmful to finishes.
- C. Protect assemblies from damage during construction. Use temporary protective coverings where needed and approved by the sunshade manufacturer. Remove protective covering at the time of substantial completion.
- D. Clean and touch up minor abrasions in finishes.

END OF SECTION

SECTION 10260

WALL PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for wall protection including:
 - 1. Corner Guards
 - 2. Wallcovering

1.2 REFERENCES

- A. National Codes (IBC, UBC, SBCCI, BOCA, and Life Safety)
- B. American Society for Testing and Materials (ASTM)
- C. Underwriters Laboratories (UL)

1.3 SUBMITTALS

- A. Submit manufacturer's product data and detailed specifications for each system component and installation accessory required, including installation instructions and methods for each type of substrate and each type of product.
- B. Submit shop drawings showing locations, extent and installation details of corner guards. Show methods of attachment to adjoining construction.
- C. Submit samples for verification purposes: Submit the following samples, as proposed for this work, for verification of color, texture, pattern and end cap attachment and alignment.
 - 1. 12 inch long sample of each model specified including end cap and mounting hardware.
- D. Submit product test reports from a qualified independent testing laboratory showing compliance of each component with requirements indicated.

1.4 QUALITY ASSURANCE

- A. Assemblies shall conform to all applicable codes.
- B. Manufacturer shall have not less than five (5) years experience in the production of specified products and a record of successful in-service performance.
- C. Provide assembled wall protection units that have been tested for impact strength in accordance with the applicable provisions of ASTM F476.

- D. Provide wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:
 - 1. Flame spread: 25 or less
 - 2. Smoke developed: 450 or less
- E. Provide wall protection system components with chemical and stain resistance in accordance:
 - 1. ASTM D-543 "Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents".
 - 2. ASTM D-1308 "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes".
- F. Engage installers who has no less than three (3) years experience in installation of systems similar in scope and complexity to the work of this project and has a history of satisfactory performance.
- G. Coordinate the installation of corner protection with work specified in Section 09250 - Gypsum Drywall.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.
- B. Store materials flat in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements. A minimum room temperature of 40 degrees F and a maximum of 100 degrees F should be maintained.

PART 2 PRODUCTS

2.1 WALL COVERING

- A. Rigid Vinyl Sheet Wall Covering shall be .060 inch thick.
- B. Rigid Vinyl Sheet Wall Covering shall be a complete system with matching accessories including caps, corners, divider bars, and caulk.
- C. Rigid Vinyl Sheet Wall Covering shall be a product of one of the following:
 - 1. Construction Specialties, Inc., 6696 State Route 405, Muncy, PA 17756, Tel: 800-233-8493, Web: c-sgroup.com
 - 2. InPro Corporation, S80 W18766 Apollo Drive, Muskego, WI 53150, Tel: 800-222-5556, Web: inprocorp.com
 - 3. Koroseal Interior Products, 3875 Embassy Parkway, Fairlawn, OH 44333

- D. Submit samples indicating full range of colors for selection by Architect.

2.2 CORNER PROTECTION

- A. Provide pre-finished anodized CBD Corner Beads as manufactured by XtremeInterior Architectural Solutions, 13623 Pike Road, Stafford Texas, 77477.
Tel :844-365-9462 Web: xtremeias.com
 - 1. Submit full range of anodized colors for selection of color by Architect.
- B. Products of other manufacturers equal in material, quality of construction, design, color, and style may be acceptable upon submission of product data showing evidence of equivalency to the product specified and approval by the architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide necessary blocking at locations required to complete wall protection work as specified. Blocking shall be secured to structure as required to provide proper support for wall protection materials. Blocking meet dynamic loading requirements of wall protection systems. Blocking shall be continuous for the length and height of corner guards, crash rails, hand rails, and bumper guards.
- B. Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.
- C. Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.3 INSTALLATION

- A. Locations:
 - 1. Corner protection shall be installed as indicated on the drawings.
 - a. Unless otherwise noted, corner protection shall be installed from top of base to full height of wall.
 - 2. Wall Covering shall be installed at locations and at heights indicated on drawings.

- B. Install units plumb and level, in locations and with mountings as shown. Securely attach to supporting structure and blocking with concealed fasteners, in accordance with manufacturer's installation instructions and approved shop drawings.
- C. Install the work of this section in strict accordance with the manufacturer's printed instructions, using only manufacturer approved materials and mounting hardware, and locating all components firmly into position, level and plumb.
- D. Temperature at the time of installation must be between 65 degrees and 75 degrees F and be maintained for at least 48 hours after the installation.

3.4 CLEANING AND PROTECTING

- A. At completion of installation, clean surfaces in accordance with manufacturer's instructions.
- B. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains

END OF SECTION

SECTION 10290

INSECT SCREEN

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for fabrication and installation of insect screen panels to be mounted in aluminum storefront and related accessories.

1.2 QUALITY ASSURANCE

- A. Screen fabricator/installer/subcontractor shall be one regularly engaged in fabricating and installing insect screens and have a minimum of 10 years experience in the installation of insect screening products similar in size and scope to the work of this project.
- B. Screen fabricator shall have a facility that uses modern screen fabrication tools including screening tables, saws, jigs, cutters, and other devices specifically designed and required for quality fabrication of products specified.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and specification information on all insect screen and accessories.
- B. Submit a 24 inch square fabricated screen panel using specified products.
- C. Submit experience record and qualifications of screen fabricator/installer including list of successfully completed projects of similar size and scope of the work of this project.

1.4 JOB CONDITIONS

- A. Do not perform work under adverse weather or job conditions.

1.5 HANDLING AND DELIVERY

- A. Protect screen during transit, storage, and handling to prevent damage.

1.6 COORDINATION

- A. Coordinate the work of this Section with Section 08410 - Aluminum Storefront.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide screen materials equal to products of C.R. Laurence Company, Inc., 2503 E. Vernon Avenue, Los Angeles, CA 90058-1826 Web: crlaurence.com

2.2 MATERIALS

- A. Insect Screen: CRL 20 x 20 Micro-Weave Insect Screen
- B. Framing: CRL 7/16 inch Heavy Wall Extruded Aluminum Frame
- C. Corner reinforcement: CRL Plastic Miter Cut Screen Frame Corners
- D. Screen retainer: CRL Screen Retainer Spline
- E. Provide other products required for a complete screen installation as indicated on drawings.

2.3 FABRICATION

- A. Fabricate screen panels in accordance with screen manufacturer's instructions.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas in which screen panels are to be installed and report any conditions detrimental to the proper installation of screening panels to the Contractor. Do not proceed with installation until such conditions have been corrected.

3.2 SCREEN INSTALLATION

- A. Do not commence screening work until the aluminum storefront system is completely installed.
- B. All screening work shall be performed by experienced technicians having highest quality workmanship. Corners shall be well formed.
- C. Remove and replace screen which is damaged in any way during construction period, including natural causes, accidents, and vandalism.
- D. Install screen panels level and true.
- E. Clean and trim excess screen materials from edges promptly after installation, and eliminate stains and discolorations.

3.3 PROTECTION

- A. Protect screen panels immediately upon installation to prevent damage.
- B. Remove and replace screen which is damaged during construction period, including natural causes, accidents and vandalism.

3.4 CLEANING

- A. Clean screen panels on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 10420

LETTERS AND PLAQUES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes cast aluminum building letters and building plaque. The extent of letters and plaques is indicated on drawings.

1.2 QUALITY ASSURANCE

- A. Provide each type of letter and plaque as a complete unit produced by a single manufacturer including necessary mounting accessories, fittings and fastenings.
- B. Manufacturer of letters and plaques shall be regularly engaged in the manufacture of the type of letters and plaques specified and shall have a minimum of five (5) years experience in manufacturing signage similar in design, size and scope to the work of this project.

1.3 SUBMITTALS

- A. Submit manufacturer's technical data and installation instructions for each type of letter and plaque required.
- B. Submit samples of each color and finish of exposed materials and accessories required for each type. Architect's review of samples will be for color and texture only. When requested, furnish full-size samples of materials.
- C. Submit shop drawings for fabrication and erection of letters and plaques. Include plans, elevations, and large scale details of sign wording and lettering layout. Provide full size building plaque shop drawings with all art work and names listed. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All letters and plaques shall be equal to products by Gemini, 103 Mensing Way, Cannon Falls, MN 55009. Web: geminisignproducts.com

2.2 DIMENSIONAL LETTERS

- A. Lettering shall be cast aluminum anodized dimensional letters.
 - 1. Stud mounted.
 - 2. Flush with Substrate.

3. Size: 16 inches tall.
4. Font: Helvetica.

2.3 BUILDING PLAQUE

- A. Cast Aluminum Building Plaque shall be 18 inch wide x 24 inches tall.
- B. Raised lettering shall include the following:
 1. Building Name and Logo
 2. Owner's Name
 3. Dedication Date
 4. Owner's Representative Listing (Mayor and City Council)
 5. Architects Name
 6. Consultant Listing (as indicated on drawing title page)
 7. Contractor Listing
- C. Lettering style and size: Arial, size as allowed by plaque size
- D. Background Color: Black Matte
- E. Finish: Stipple
- F. Border: Single Line

2.4 FIRE STATION 20 CITY LOGO SIGN

- A. Relocate existing sign from existing building to location indicated on drawings. Provide mounting hardware and other devices as required to mount sign on masonry wall as indicated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the substrates and conditions under which the letters and plaques are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION

- A. Install units and components at the locations shown or scheduled, securely mounted with concealed theft-resistant fasteners, unless otherwise indicated. Attach signs to substrates in accordance with the manufacturer's instructions, unless otherwise shown.

- B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of lettres and plaque units to finish surfaces. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 10450

SPECIALTY SIGNS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for speciality signs to include but the following:
 - 1. Wall and Door signs.
 - 2. Directional signs.
 - 3. Locker name plates.
- B. The extent of specialty signs are shown on drawings or in schedules.

1.2 QUALITY ASSURANCE

- A. Provide specialty signage by one manufacturer regularly engaged in the manufacture of the type of signs specified with a minimum of five (5) years experience in manufacturing signage similar in design, size and scope to the work of this project.
- B. Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.3 SUBMITTALS

- A. Submit manufacturer's technical data and installation instructions for each type of sign required.
- B. Submit three (3) samples of each color and finish of exposed materials and accessories required for specialty signs. Architect's review of samples will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Where requested, furnish full-size samples of specialty sign materials.
- C. Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Indicate location for each sign. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Independent Specialty Signage, Inc., 147 Wallins Corners Rd #3, Amsterdam, NY 12010. Web: chooseiss.com Tel: 518-698-5657

1. Products of other manufacturer's are acceptable upon submittal of data substantiating compliance with the requirements of this Section and approval by the Architect.

2.2 GRAPHIC PROCESS

- A. All signs shall be manufactured using ISS Graphic Process Sand Etched
 1. Tactile characters and text shall be raised not less than 1/32 inch from sign face in precisely formed characters with square-cut edges, free from burrs and cut marks. Glued-on or chemically welded letters and raster and/or reverse punched braille is not acceptable.
 2. All text shall be accompanied by Grade 2 braille. Braille shall be separated 1/2 inch from the corresponding raised characters or symbols. Grade 2 braille translation shall be provided by sign manufacturer.
 3. Perimeter borders shall be 3/8 inch.
 4. Letters, numbers and/or symbols shall contrast with their background, with light characters on a dark background. Characters and background shall have a non-glare finish.
- B. Melamine shall be non-static, fire-retardant, NEMA rated "self-extinguishing", impervious to most acids, alkalies, alcohol, solvents, abrasives and boiling water.
 1. Material Thickness: 1/8 inch
 2. Maximum continuous operating temperature 225 degrees F.
- C. Sign material: phenolic resin plastic sheet with melamine laminate and contrasting core color.
 1. Flexural strength flat 25,000 psi
 2. Tensile strength 22,000 psi
 3. Compressive strength flat 47,000 psi
 4. Shear strength 16,800 psi
 5. Dielectric strength short Time (D229 test) 330 volts/Mil
- D. Letterform shall be upper and lower case.
- E. Size of letters and numbers shall be as follows:
 1. Room numbers shall be 1 inch tall.
 2. Lettering for room ID signs shall be 3/4 inch tall text.

3. Symbol size shall be 4 inches tall.
4. Standard Grade 2 braille shall be 1/2 inch below copy.

F. Style: Rectangular with no border.

2.3 WALL AND DOOR SIGNS

- A. Furnish signs for each door or adjacent to each door or space. All rooms/areas shall have a sign designating the room/area name. Room/area names shall be as indicated on the drawings. Bedrooms, Toilets, Pantries, and other rooms with same names shall be consecutively numbered.

2.4 DIRECTIONAL SIGNS

- A. Furnish directional signs in corridors, lobbies, and at other locations where noted.

2.5 SIGN MOUNTING

- A. Silastic Adhesive Mounting with vinyl foam tape to hold the sign in place until silastic adhesive has cured.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the substrates and conditions under which the specialty signs are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

- A. Install sign units and components at the locations indicated. Securely mount signs with concealed theft-resistant fasteners, unless otherwise indicated. Attach signs to substrates in accordance with the manufacturer's instructions, unless otherwise indicated.
- B. Provide ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1 signs installed on glass with a backing plate on the side opposite the sign so that the lettering is not visible from the back side. Backing plate shall be the same material and size as the sign.
- C. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 10452

TRUSS EMBLEM

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for a truss emblem.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings showing truss emblem layout, location, and method of attachment.

1.3 QUALITY ASSURANCE

- A. Truss emblem shall comply with the requirements of the State Fire Marshall, State of Mississippi, regarding truss emblem signage on buildings.

1.4 COORDINATION

- A. Coordinate the location of the Truss Emblem with other signage.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Mohawk Sign Systems, Inc. Architectural Graphics; P.O. Box 966, Schenectady, NY 12301, Tel: 518-842-5303, Fax 518-842-5306, web: mohawksign.com
- B. Other manufacturers regularly engaged in the manufacture of safety signage and related materials are acceptable upon compliance with the requirements of this Section.

2.2 EMBLEM

- A. Emblem shall be made of (.063) aluminum with a bright reflective paint or applied vinyl surface.
- B. Emblem shall be in the shape of an isosceles triangle measuring six (6) inches horizontally and three (3) inches vertically.
- C. Emblem shall have letters printed in the center of the triangle based on the type of truss construction used in the building being identified by the emblem:
 - 1. "F" to signify a floor with truss construction
 - 2. "R" to signify a roof with truss construction

3. "F/R" to signify both a floor and roof with truss construction
- D. Colors and graphics shall be as follows:
1. Text style shall be Helvetica Medium
 2. 3/8 inch wide white border shall be on all three sides.
 3. Center background triangle shall be red.
 4. 1 1/4 inch tall lettering (F, R, or F/R) shall be white and centered on red background.
 5. Along base (6 inch length) of triangle centered on the white border include the following 1/4 inch tall all capital lettering in red:
 - a. Do Not Remove By Order Of the Local Fire Inspector
- E. Accessories: Provide stainless steel mounting screws appropriate for surface to which sign will be mounted.
- F. See suggested layout at the end of this Section.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

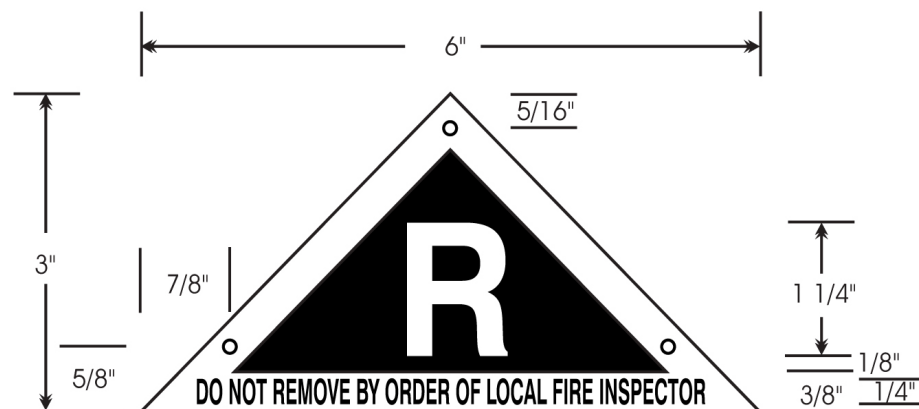
- A. Assure that area to receive emblem is clean and properly prepared prior to installation.

3.2 INSTALLATION

- A. Permanently affix emblem to the exterior of the building to the left of the main entrance door at a height of 5'-0" above the finish floor or grade.

3.3 CLEANING AND PROTECTING

- A. Protect emblem from damage after installation.



END OF SECTION

SECTION 10505

METAL LOCKERS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for the following:
 - 1. Standard steel lockers with flat tops.
 - 2. Specialty Turn-out Gear Lockers
 - 3. The extent and size of the lockers is shown on the drawings.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM) A 366/A 366M - Standard Specification for Steel Sheet, Carbon, Cold-Rolled, Commercial Quality.

1.3 SUBMITTALS

- A. Submit 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.
- B. Submit shop drawings for the fabrication and erection of lockers, showing layout, elevations, dimensions, anchorage and other necessary items as required for a complete installation.
- C. Submit maintenance data for adjusting, repairing, and replacing locker doors and latching mechanisms.
- D. Submit two (2) complete sets of color chips representing manufacturer's full range of available colors.
- E. Submit two samples, minimum size 6 inches (150 mm) square, representing actual product and color selected.

1.4 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of lockers similar in size and scope to the work of this project.
- B. Installer shall have a minimum of five (5) years experience in the installation of lockers similar in size and scope to the work of this project.

PART 2 PRODUCTS

2.1 STANDARD METAL LOCKERS

- A. Metal lockers equal to products manufactured by Penco Products, Inc., 1820 Stonehenge Drive, Greenville, NC 27858. Tel: 800-562-1000 Web: www.pencoproducts.com

1. Model Numbers:

- a. Model: Vanguard 6181R (Type 1)

- 1) Size: 18 inches x18 inches
- 2) Color: to be selected

- b. Model: Vanguard 6196R (Type 2)

- 1) Size: 18 inches x 24 inches
- 2) Color: To be selected

B. Materials

1. Steel: Prime grade mild cold-rolled sheet steel free from surface imperfection, capable of taking a high-grade enamel finish.
2. Hooks: Zinc plated forged steel, ball ends.
3. Bolts and Nuts: Zinc plated truss fin head bolts and hex nuts.
4. All components shall be made from mild cold-rolled domestic furniture steel, (ASTM) A 366/A 366M, free of surface imperfections and capable of taking a high grade baked enamel finish.

C. Frame

1. Door frame members shall be formed into channel shapes from 16 gauge furniture steel. Vertical members shall have additional flange to provide a continuous door strike. Corners to be tenoned and electrically welded making a solid and rigid one-piece structure. Frames shall be punched for attachment to the body on 9 inch centers with no exposed bolts or rivet heads on front of frame. Center cross rails shall be 16 gauge on all double and triple tier locker frames for additional rigidity. Frame design shall provide clear access into locker equal to door width. Double and single tier lockers shall include intermediate cross frames.

D. Doors

1. Doors shall be 16 gauge steel suitably flanged; with one right angle bend at top and bottom, and a channel formation at the vertical flanges on the

lock and hinge side. Triple tier and box doors shall have one right angle bend on all four sides. Doors 1'-3inch wide and wider shall be arch-welded at all four corners for added rigidity. Single tiered doors 1'-6inch wide and wider shall have a reinforcing panel welded to the inside.

2. Doors shall be further reinforced with a hat channel top to bottom welded inside the door and filled under compression with structural acoustical material.

E. Hinges

1. Hinges shall be .072 inch thick, five-knuckle, tight pin style hinges, 2 inch long with concealed fastenings and be welded to frame and bolted to door with two (2) bolts to each hinge. Doors 42 inches high and less shall have two (2) hinges. Doors over 42 inches high shall have three (3) hinges.

F. Handles

1. Handles shall be one-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks.
2. Latching: Lifting trigger 14 gauge steel, attached to the latching channel. Trigger shall have a padlock eye for use with 9/32 inch diameter padlock shackle. Doors to have latch clip engaging frame at three (3) points on doors over 42 inches high and two (2) points on all other doors. Locking device to be positive automatic type, whereby locker door may be locked when open, then closed without unlocking. A rubber silencer shall be firmly secured to the frame at each latch hook.
3. The locking bar latch shall be of 12 gauge solid steel, ridged horizontally to afford sure grip. Completely enclosed in and protected by a stationary handle of chrome plated die cast zinc alloy with 40,000 psi minimum tensile strength.
4. The operation of the lifter shall be cushioned against impact noise by means of live rubber pads, imbedded in the stationary handle at the upper and lower motion limits of the latch lifter. The handle shall be attached to door with five (5) points of contact to provide maximum protection against vandalism. Handles shall be secured to door and latch lifter to locking bar channel.

G. Ventilation

1. Door perimeter ventilation shall be equal to or approximate vent area provided by standard door louvers. Frames must be free of any flanges which would baffle or impede the air flow.

H. Body

1. Body of locker including tops, backs, sides, bottoms and shelves shall be

domestic 24 gauge steel. Sides shall be flanged to give double thickness of metal at connections. Tops and bottoms shall be flanged all four sides. Shelves shall be full depth with four sides formed to 90 degrees and the front edge shall have a second bend. Surface of bottom shall be flush with frame. Components shall be assembled together on 9 inch centers.

I. Number Plates

1. Each locker shall have polished aluminum number plate with black etched numerals not less than 3/8 inch high. Plates shall be attached to doors with pop rivets. Unless otherwise specified, lockers shall be numbered consecutively from one up.

J. Accessories

1. Bases:

- a. Zee base shall be 14 gauge sheet steel, powder coated to match the color of the lockers.
- b. Front base/closed end base shall be 18 gage sheet steel, powder coated to match the color of the lockers. Front bases shall be installed between the front legs without overlap or exposes fasteners. End bases shall be installed between front and rear legs of lockers at end of a row.

2. Recess Trim: Recess trim shall be 18 gauge sheet steel, powder coated to match the color of the lockers.

3. Locks:

- a. Built-In Combination Locks: Built-in combination locks shall have five (5) combination changes and be furnished with master keys. Locks shall be furnished with stainless steel escutcheon plates and dead bolts or spring bolts LH or RH reversible.

K. Finsh

1. All steel parts shall be thoroughly cleaned and treated with a phosphate solution to protect against rust and corrosion, and to insure proper bonding of the enamel finish.
2. Lockers shall be given a heavy coat of high quality enamel with the locker fronts being sprayed by means of an electrostatic spray system to give more uniform coverage. The lockers shall be baked at 300 degrees to assure a harder finish for longer usage. Color shall be as selected.

2.2 TURNOUT GEAR LOCKERS

- A. Equal to GearGrid Corporation, 670 SW 15th Street, Forest Lake, MN 55025.

B. Model: Geargrid Wall Mounted Storage System. (Type 3)

1. Locker Sizes:
 - a. Super Jumbo 24 inch:
 - 1) 74.5 inches high
 - 2) 25.25 inches wide
 - 3) 24 inches deep.
 - 4) Clear Opening Width 22.75 inches
2. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.
3. Vertical Dividers:
 - a. Outer Frames: 1.25 inch O.D. x 16 gauge wall thickness ASTM A513 steel tubing.
 - b. Inner Grid: .25 inch diameter ASTM 510 cold drawn steel wire resistance welded to a 3inch square pattern.
 - c. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
 - d. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.
 - e. Inner Grid wires shall intersect and cross all perpendicular wires, and shall be welded at all intersections.
4. Back Panel:
 - a. Required on each locker to protect the locker contents and wall substrate, as well as provide an additional panel for accessory attachment.
 - b. Grid: .25 inch diameter ASTM 510 cold drawn steel wire resistance welded to a 3 inch square pattern.
 - c. Back panel must engage and be secured to vertical dividers via horizontal wires which extend into mounting holes pre-drilled in

vertical dividers. Back panels are sandwiched between vertical dividers, preventing them from being removed after assembly is complete.

- d. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
 - e. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.
 - f. Inner Grid wires shall intersect and cross all perpendicular wires, and shall be welded at all intersections.
- 5. Shelves: One (1) Upper and one (1) Lower shelf constructed of .25 inch diameter ASTM 510 cold drawn steel wire resistance welded and cold formed. Upper shelf shall include an integrated 20 gauge steel bracket to accept a 2 inch x 16 inch name placard to be provided by Owner.
 - 6. Apparel Hooks: (3) per locker opening constructed of .192 inch diameter ASTM 510 cold drawn steel wire resistance welded, cold formed and powder coated. Apparel hooks must securely engage and snap onto side or back grid, to prevent unintentional disengagement of hook.

C. Hang Bars:

- 1. Hang Bars shall be manufactured to allow each locker user to install at their desired height. Hang Bars that span multiple locker openings are not acceptable.
- 2. Tube: 1.25 inch O.D. x 16 gauge 304 stainless steel tubing.
- 3. Brackets: Allow Hang Bars to be securely attached to each vertical divider, powder coated.

D. Heavy Hanger:

- 1. .25inch diameter 304 stainless steel wire cold formed and resistance welded.
- 2. Black vinyl coating on hook end.

E. Gear Dryer Hanger:

- 1. .25 inch diameter 304 stainless steel wire cold formed and resistance welded. Includes formed loops to prop open sleeves on jackets to promote better circulation throughout the garment.
- 2. Black vinyl coating on hook end.

F. Glove Drying Hanger:

1. .25 inch diameter 304 stainless steel wire cold formed and resistance welded.
2. Black vinyl coating on hook end.

G. Finish

1. Components shall be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable and UV-stable TGIC powder coating process. Thickness of applied finish shall be 3 - 4 mm for added protection.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates and bases have been properly prepared.
- B. If substrate and bases are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install lockers and accessories at locations shown in accordance with manufacturer's instructions.
- B. Install lockers level and plumb with flush surfaces and rigid attachment to anchoring surfaces.
- C. Anchor lockers to floor and wall at 48 inches or less, as recommended by the manufacturer.
- D. Bolt adjoining locker units together to provide rigid installation.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.
- B. Touch-up with factory-supplied paint and repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes hand carried portable fire extinguishers and related mounting brackets, cabinets and accessories.

1.2 QUALITY ASSURANCE

- A. Provide portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for each type, rating, and classification of extinguisher indicated.
- B. Comply with the latest edition of NFPA 10, Standard for Portable Fire Extinguishers.
- C. Conform to the Americans With Disabilities Act 1990 for cabinet location and projection into corridors.
- D. Manufacturer of fire extinguishers shall have a minimum of ten (10) years experience in the manufacture of fire extinguishers and related accessories.

1.3 SUBMITTALS

- A. Submit manufacturer's technical data and installation instructions for portable fire extinguishers, cabinets, and signage.
- B. Submit shop drawings showing location of fire extinguishers and large scale installation details indicating attachment to adjacent materials and coordination with wall finishes.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The products of J. L. Industries are specified to establish the level of quality. Products of the following companies will be acceptable upon compliance with the requirements of this Section.
 - 1. Larsen's Mfg. Co.
 - 2. Watrous, Inc.

2.2 FIRE EXTINGUISHERS

- A. Provide fire extinguishers for each location indicated, in colors and finishes which comply with requirements of governing authorities.

1. Type 1: Multi-Purpose Dry Chemical for Cabinet Mounting or Bracket Mounting: Equal to J.L. Industries Cosmic 10E, U.L. rated 4A-80BC, 10 pound nominal capacity.
2. Type 2: Class K Wet Chemical for Bracket Mounting: Equal to J.L. Industries Saturn 25. U.L. rating K, 2.5 gallons capacity.
3. Type 3: Multi-purpose Carbon Dioxide for Bracket Mounting: Equal to J.L. Industries Sentinel 10. U.L. rating 10 BC, 10 pound nominal capacity.

2.3 MOUNTING BRACKETS

- A. Provide manufacturer's standard bracket designed to prevent accidental dislodgement of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

2.4 RECESSED EXTINGUISHER CABINETS

- A. Equal to J.L. Industries Clear Vu 1525 F25. Units shall have clear anodized aluminum door and frame, fully welded and buffed smooth, and accommodate the Cosmic 10E extinguisher. Provide black die-cut all capitol letters spelling, FIRE EXTINGUISHER, arranged vertically on cabinet door.
- B. Where cabinets are installed in fire rated walls, provide rated cabinet and appropriate drywall backing in accordance with manufacturers and U.L. listed standards to comply with rating of walls.

2.5 REQUIRED PLACARDING

- A. Provide placarding for all Class "K" Wet Chemical fire extinguishers in accordance with the requirements of NFPA 10 figure A5.5.5.3 (a).
 1. Place placard above extinguisher mounted on the wall in a permanent manner.
 2. Placard to read as follows: "WARNING In case of appliance fire, use this extinguisher only after the fixed fire suppression system has been actuated".
 3. Placard size to be 11 inches horizontally and 7.6 inches vertically printed in English and Spanish on 0.4 inch white styrene. Print to be reverse printing in PMS 485 red with "WARNING" in 0.6 inch size letters and 0.25 inch letters for remainder of information.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install items included in this Section at locations indicated, or if not indicated, in exposed locations in a manner such that no point in the building will be further than 75 feet travel distance from an extinguisher.
- B. For areas with a class B hazards, extinguishers shall be placed at intervals not greater than 50 feet.
- C. Install cabinets in non fire rated walls unless noted otherwise. Where installed in fire rated walls, provide rated walls around back and all sides of cabinet equal to the rating of the wall.
- D. Install mounting brackets or cabinet so that the top of fire extinguisher handle is located 48 inches above the floor, or at heights to comply with applicable regulations of governing authorities. Coordinate location of cabinet with handrails and other devices and notify Architect if conflict occurs prior to installation.
- E. Securely fasten mounting brackets or cabinets to structure, square and plumb, to comply with manufacturer's instructions. Provide blocking as required to support applied loads.

3.2 CLEANING AND PROTECTION

- A. Protect fire extinguisher and cabinet from damage during construction. Do not paint. Clean as recommended by manufacturer.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements custom designed, pre-engineered, post and wall supported, canopies and walkway covers.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Submit shop drawings indicating field dimensions, structural component locations/positions, blocking, attachment devices, flashing, material dimensions and details of construction and assembly.
- C. Submit signed and sealed structural calculations for walkway covers and canopies by a professional engineer registered in the jurisdiction in which the project is located. Provide reactions as required for footing design.

1.3 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of canopies and walkway covers similar in design, scope, and complexity to the work of this project.
- B. Installer shall have a minimum of five (5) years experience in the installation of canopies and walkway covers similar in size and scope of the work of this project.
- C. All canopy and walkway cover components shall be by a single manufacturer.
- D. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- E. Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fit of work. Allow for adjustments within specified tolerances wherever taking field measurements.
- F. Coordinate work of this Section with work of other sections which interface with covered walkway system including but not limited to masonry, building fascias, and lighting.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide aluminum covered walkway and canopy systems that has been designed, produced, fabricated, and installed to withstand normal temperature

changes, live loading, dead loading, and wind loading in compliance with governing Building Code requirements for geographic area in which the work is located.

1. Live load: 30 psf minimum
 2. Design Wind Velocity: 110 mph
 3. Importance factor: 1.1
- B. Structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting concentrated loads such as being walked upon.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle covered walkway and canopy system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Mapes Canopies, LLC, 7748 North 56th Street, Lincoln, NE. Tel: 888-273-1132. Web: mapescanopies.com
1. Mapes Post Supported Extruded Aluminum Walkway Cover System
- B. Other manufacturers are acceptable upon compliance with the requirements of this Section and approval by Architect.

2.2 MATERIALS

- A. General: Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and manufacturer's standard thicknesses.
- B. Decking: 3.4 inches x 6 inches x .078 Flat Interlocking Soffit Pans
- C. Fascia .125 Extruded Fascia/Gutter as indicated on drawings.
- D. Columns: 6 inches x 6 inches x .188 Extruded Tube with drain hole. Provide aluminum downspout outlet trim at bottom of drain holes to channel water away from base of columns as indicated on drawings.
- E. Beams/Gutters: As indicated on drawings.
- F. Attachment hardware shall be galvanized and powder coated to match canopy. Sizes and shapes to be determined by manufacturer.
- G. Fasteners:

1. Deck Screws: Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring and conical washer.
 2. Fascia Rivets: Size 3/16 inch by 1/2 inch grip range aluminum rivets with aluminum mandrel.
 3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
- H. Finish shall be Kynar coating. See Section 09050 Color Design for selected color.
- I. Provide all hardware, anchors, and other components as required for a complete installation as indicated on drawings.

2.3 FABRICATION

- A. Comply with indicated profiles, dimensioned requirements, and structural requirements.
- B. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.
- C. All welding do be done by heli-arc process.
- D. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.
- E. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2 inch thick by 1 1/2 inch aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.
- F. Roof Deck: Extruded Aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections shall comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'- 0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.
- G. Design structure for thermal expansion and contraction. Provide expansion joints as required.
- H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.
- I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Verify conditions prior to installation and report any conditions detrimental to the proper placement and installation of canopy system. Do not proceed with installation until detrimental conditions have been corrected.
- B. Installation shall be as indicated on drawings and in strict accordance with approved shop drawings.

3.2 CLEANING AND PROTECTION

- A. Protect the finish during handling and erection.
- B. After installation, entire system shall be left in a clean condition.
- C. Protect canopy and walkway system from damage until final acceptance.

END OF SECTION

SECTION 10670

MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes requirements for the following miscellaneous specialties:

1. Steel wire storage shelves.
2. Steel work bench.

1.2 SUBMITTALS

A. Submit 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.

B. Submit shop drawings for the fabrication and erection of lockers, showing layout, elevations, dimensions, anchorage and other necessary items as required for a complete installation.

C. Submit maintenance data for adjusting, repairing, and replacing locker doors and latching mechanisms.

D. Submit two (2) complete sets of color chips representing manufacturer's full range of available colors.

1.3 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of lockers similar in size and scope to the work of this project.

B. Installer shall have a minimum of five (5) years experience in the installation of lockers similar in size and scope to the work of this project.

PART 2 PRODUCTS

2.1 STEEL WIRE SHELVING

A. Shelving shall be equal to Advance Tabco.

1. For each shelving unit provide:
 - a. 4 ECP-86 Post

- b. Six (6) EC-1848 Shelves
- c. Provide feet, caps, screws, wall anchors, and other accessories for a complete shelving installation.

2.2 WORKBENCH

- A. Workbench shall be equal to Tennesco model WB-1-3072S.
 - 1. Top: 12 gauge steel work surface reinforced with 14 gauge end channels. Smooth surface will not absorb oil or crack. Baked enamel finish.
 - 2. Flared Legs: Flared legs constructed of all welded 13 gauge steel with 14 gauge lower cross members.
 - 3. Stringer: 14 gauge steel.
 - 4. Accessories:
 - a. Drawer kit: WBD-1
 - b. Lower steel shelf: S-72
 - c. Pre-wired electronic riser shelf: REI-18-1572-WK-1
 - d. Provide brackets, bolts, nuts, washers, screws and other accessories as required for a complete installation.
 - 5. Color: Medium Grey

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until building is enclosed, interior work is complete, and HVAC systems activated.

3.2 INSTALLATION

- A. Assemble products in accordance with manufacturer's directions.
 - 1. Workbench: Install drawer at far left when facing bench.
 - 2. Shelving: Install individual shelves with bottom shelf set 1 inch above floor to bottom and top shelf aligned with top of supports. Equally space intermediate shelves between top and bottom shelf.
- B. Install products at locations shown in accordance with manufacturer's instructions.

- C. Anchor shelving and workbench to floor and/or wall as required to prevent movement and overturning.

3.3 ADJUSTING AND CLEANING

- A. Touch-up with factory-supplied paint and repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for toilet accessories and related specialties. The extent of each type of toilet accessory and speciality item is shown on the drawings and schedules.

1.2 QUALITY ASSURANCE

- A. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, unless otherwise acceptable to the Architect. Stamped names or labels on exposed faces of units will not be permitted.
- B. Provide products that comply with applicable ANSI (American National Standards Institute) and Americans with Disability Act (ADA) standards.

1.3 SUBMITTALS

- A. Submit manufacturer's product and technical data indicating compliance with these specifications.
- B. Submit shop drawings for the fabrication and installation of all toilet accessories. Show all anchorage to substrates and blocking and other necessary items for complete installation.
- C. Submit samples for review as requested by the Architect. Samples may be incorporated into work.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. A&J Washroom Accessories, Inc., 509 Temple Hill Road, New Windsor, NY. Tel: 845-562-3332
- B. Equal products of other manufacturers equal in appearance, quality, and performance are acceptable.

2.2 ACCESSORIES

- A. Mirrors: Provide 1/4 inch polished plate glass, electrolytically plated mirrors with 3/4 inch stainless steel angle frames equal to U700. Mirrors shall be 24 inches x 36 inches unless noted otherwise. Mount in locations shown.
- B. Surface Paper Towel Dispenser: Unit shall be equal to U180 and dispense

four-hundred (400) multi-fold paper towels. Locate as indicated on drawings.

C. Soap Dispensers:

1. Provide U128PCA counter mounted unit at counter mounted lavatories. Coordinate location and installation with work specified in Section 06200 - Architectural Woodwork. Dispenser shall be installed so that soap spout is positioned over lavatory.
2. Provide U124 wall mounted dispenser. Locate at each wall mounted lavatory as indicated on drawings.

D. Grab Bars at Toilets: Provide 1-1/2 inch diameter stainless steel grab bars with satin non-slip surface and concealed mounting equal to UG3-A36, UG3-A18, and UG3-A42. Locate at ADA toilet as indicated on drawings.

E. Toilet Paper Dispenser: Provide surface mounted multi-roll toilet tissue dispenser equal to U806-NC non-controlled delivery. Locate at each water closet and as indicated on drawings.

F. Towel Bar: Provide UX132-BF x 24 inches adjacent to each shower unit as indicated on drawings.

G. Mop Holder with Utility Shelf: Provide UJ45B, 44 inches long. Locate as indicated on drawings.

H. Coat Hooks: Provide UX116 clothes hooks. Locate one (1) on back of each toilet room door at 60 inches above finish floor. At ADA compliant toilet, provide one at 60 inches above finish floor and one at 46 inches above finish floor.

I. Shower Curtains, Hooks and Rods:

1. Provide UX250P shower curtains shall be opaque, high performance heavy duty vinyl, non-toxic, self-deodorizing, antibacterial and flame-retardant, with rust proof anodized outlets along top, one every 6 inches. Bottom and sides are hemmed. Color as selected by Architect. Height 72 inches x width to fill opening as recommended by manufacturer.
2. Curtain hooks shall be Type 304 stainless steel for use on 1 1/4 inch diameter shower curtain rods equal to UX169.
3. Shower curtain rods shall be satin finish 18-gauge type 304 stainless steel, 1 1/4 inch diameter, equal to UX2, as required to span opening.
4. Locate shower curtain, hooks, and rod at each shower and bath unit.

J. Waste receptacle at Kitchen: Provide U470-36 trash receptacle without top.

K. Waste receptacle at Toilets: Provide U473 13 gallon trash receptacle with U473 top.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which toilet accessories and specialties are to be installed and verify that all required blocking is in place. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PREPARATION

- A. All toilet accessories and specialties shall be securely attached to concealed solid wood blocking which is secured to structural or wall framing components. Blocking shall be installed for the full perimeter and length of all accessories and specialties and wherever attachments are to be made. Blocking shall be installed in such a manner as to resist all applied loads and stresses. Follow manufacturer's instructions for attaching accessories and specialties to blocking and concealed attachment devices.
 - 1. For owner supplied toilet accessories coordinate location of concealed blocking with Owner's vendors.

3.3 INSTALLATION

- A. Use concealed fastenings wherever possible. Provide anchors bolts and other necessary anchorages and attach accessories securely to walls and partitions in locations as shown or directed. Install concealed mounting devices and fasteners fabricated of the same material as the accessories, or of galvanized steel, as recommended by manufacturer.
- B. Grab bars shall be installed to support a minimum of nine hundred (900) pounds.
- C. Install exposed mounting devices and fasteners finished to match the accessories. Provide theft-resistant fasteners for all accessory mountings. Secure toilet room accessories in accordance with the manufacturer's instructions for each item and each type of substrate construction.
- D. Install products at locations shown on the drawings. Install products in accessible Toilet 120 in conformance with applicable ANSI (American National Standards Institute) standards and Americans with Disability Act (ADA) requirements.

END OF SECTION

SECTION 11143

EQUIPMENT RACK

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes requirements for wall mounted communication equipment rack.

1.2 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions. Submittals shall contain sufficient data to evaluate performance and quality in regard to the attributes of the products specified.

1.3 QUALITY ASSURANCE

- A. Equipment manufacturer shall have a minimum of ten (10) years experience in the manufacturing of appliances similar to the work of this project.
- B. Coordinate the installation of the equipment rack with products specified in other specification sections, electrical drawings, and/or equipment provided by Owner.

1.4 PRODUCT HANDLING

- A. Deliver components to job site in protective packaging.

PART 2 PRODUCTS

2.1 MANUFACTURER AND MODEL

- A. Equal to Middle Atlantic Products, Tel: 973-839-1011, Web: middleatlantic.com
 - 1. Rack shall be WM-30-18
 - a. Self-squaring, fixed design, with black powder coat finish.
 - b. EIA/TIA compliant and RoHS EU Directive 2002/95/EC compliant
 - c. Top Channel: 14 gage steel
 - d. Rack Rail: 11 gage steel tapped with 32 holes

2.2 WARRANTY

- A. Rack shall be warrantied to be free from defects in material or workmanship under normal use and conditions for the lifetime of the product

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all products in accordance with manufacturer's instructions.

END OF SECTION

SECTION 11452

APPLIANCES

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes furnishing and installing appliances at locations indicated on drawings.

1.2 SUBMITTALS

- A. Submit manufacturer's product data, specifications, standard details, and installation instructions. Provide all sizes, rough in opening data, plumbing and electrical requirements. Submittals shall contain sufficient data to evaluate performance and quality in regard to the attributes of the products specified.

1.3 QUALITY ASSURANCE

- A. Equipment manufacturer shall have a minimum of ten (10) years experience in the manufacturing of appliances similar to the work of this project.
- B. Equipment Installer shall have a minimum of five (5) years experience and shall have completed project of similar size and scope of the work of this project.
- C. Coordinate the installation of the products specified in this section with appropriate mechanical and electrical specification and graphic documents.

1.4 PRODUCT HANDLING

- A. Deliver components to job site in protective packaging.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MODELS

- A. Ice Maker: Equal to GE UNC15NJII
- B. Dishwasher: Equal to GE PDF820SSJSS
- C. Refrigerator: Equal to GE GDE25ESKSS
- D. Microwave Oven: Equal to GE PEB9159SJSS
- E. Washer: Equal to Whirlpool Commercial CHW9060AW
- F. Dryer: Equal to Whirlpool Commercial CED9060AW
- G. Range: Equal to Thor Gas Range Model HRG3617U
- H. Hood: See Mechanical/Electrical
- I. Monitors/TV's: Equal to VIZIO SmartCast E-Series 70 inch Class Ultra HD Home Theater Display.
 - 1. Accessories: Provide wall mount kit, wall mount 5.1 sound bar and satellite speakers, and other related components and accessories that are required for a complete and functioning system.

2.2 (PPE) WASHER AND DRYER CABINET

- A. Personal Protective Equipment (PPE) washer and dryer shall be equal to UniMac, Shepard St., Ripon, WI 54971.
Tel: 800-587-5458 Web: www.unimac.com
 - 1. Washer: UCN040
 - 2. Drying Cabinet: Model UTGC

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all products in accordance with manufacturer's instructions.
- B. Make all appropriate mechanical, electrical, and plumbing connections. Provide devices and connections a required for television monitors and related devices.
- C. Installer shall demonstrate proper operation and maintenance procedures to owner's personnel. Provide the owner with written operating instructions and contact for local technical service for each device specified in this section.

END OF SECTION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes requirements for rolling window shades. Provide window shades, accessories, attaching hardware, fascias and other components necessary to complete the work of this Section.

1.2 SUBMITTALS

- A. Submit manufacturer's product data, specifications and literature indicating materials, finishes, construction, operation and installation instructions including manufacturer's recommendations for maintenance and cleaning.
- B. Submit product certificates signed by manufacturer substantiating that products meet requirements specified.
- C. Submit shop drawings including:
 - 1. Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work. Details shall clearly show clearance at head, jamb, and sill for each mounting condition.
 - 2. Schedule of shades using same room numbering system as indicated on drawings.
 - 3. Installer shall field verify measurements for rolling shades prior submittal of shop drawings and fabrication.
- D. Submit samples of fabrics and exposed accessories and finishes. For each finish product specified, submit one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- E. Submit Maintenance Data indicating methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- F. Submit experience record of installer including list of installations similar in size and scope of the work of this project.

1.3 QUALITY ASSURANCE

- A. Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

- B. Installer/subcontractor shall be trained and certified by the manufacturer, shall have a minimum of ten years experience in installing products comparable to those specified in this section, and shall have completed projects similar in size and scope to the work of this project.
- C. Products shall pass NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Anti-Microbial Characteristics shall be 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.4 WARRANTY

- A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
- B. Roller Shade Installation: One year from date of Substantial Completion.

1.5 PRODUCT DELIVERY

- A. Deliver to project site in manufacturer's original container.
- B. All shades and accessories will be labeled as to size, type, and location.
- C. Shades shall be handled carefully and stored to prevent damage to materials, finishes and operating mechanisms.

1.6 JOB CONDITIONS

- A. Building shall be completely enclosed prior to shade installation with interior temperature maintained between 60 degrees and 90 degrees F. and relative humidity not to exceed 80 percent. All wet work shall be complete and dry.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. MechoShade Systems, Inc.; 42-03 35th Street, Long Island City, NY 11101. Tel: 718-729-2020. Web: mechoshade.com
- B. Products of other manufacturers producing equal products are acceptable upon strict compliance with the requirements of this section and approval by Architect.

2.2 ROLLER SHADE TYPES

- A. Manually operated shades:
 - 1. Mounting: Surface with fascia
 - 2. Configuration: Single
 - 3. Shadecloths: As indicated in Section 09050 Color Design

2.3 SHADE BAND

- A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - 2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
 - c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.4 SHADE FABRICATION

- A. Fabricate units for fabric width to be 6 inches wider than window interior jamb-to-jamb width and length to extend a 3 inches below window stool.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment

as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

2.5 COMPONENTS

A. Access and material requirements:

- 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
- 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

B. Manual Operated Chain Drive Hardware and Brackets

- 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
- 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
- 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously.
- 4. Provide shade hardware system that allows smooth operation.
- 5. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
- 6. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
- 7. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center

supports and connectors for multi-banded shades.

- b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch steel pin.
- c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 pounds in the stopped position.
- d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
- e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- f. Drive Chain: Number 10 qualified stainless steel chain rated to 90 pound minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 ACCESSORIES

- A. Pocket: 4133 pocket surface mounted with end closures and bottom pocket closure. Custom color to be selected.
- B. Side channels: Provide blackout shades with room darkening side channels and bottom hembar with light seal.

PART 3 EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Shade installer shall inspect areas in which shades are to be installed and report any conditions that are detrimental to the installation or proper operation of the rolling shades. Report any conditions unacceptable in writing to the contractor and do not proceed with installations until conditions are corrected.

3.2 REPARATION

- 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.

3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Adjust backout shades to ensure a complete light seal at side channels and bottom seal to window sill.
- D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- E. Installer shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12500

FURNITURE

PART 1 GENERAL

1.1 SUMMARY

- A. The work covered by this Section consists of furnishing all labor, equipment, materials, and performing all operations for the purchase, delivery, and installation of furniture in accordance with the contract documents.

1.2 QUALITY ASSURANCE

- A. Manufacturers shall have a minimum of five (5) years experience in the manufacturing of furnishings similar in size and scope to the work of this project.
- B. Installer shall have a minimum of five (5) years experience and shall have completed a minimum of five (5) furniture installations of equal size.
- C. Manufacturers shall have financial and technical resources of sufficient scope to assure prompt and satisfactory performance in the production and delivery of all furniture specified.
- D. Installer shall have financial and technical resources of sufficient scope to assure prompt and satisfactory installation of the equipment and furniturework.
- E. Each piece of furniture shall be manufactured or furnished by one manufacturer.

1.3 SUBMITTALS

- A. Submit shop drawings showing location of each item, dimensioned plans, large scale details, and other components.
- B. Submit manufacturer's technical data, specifications and installation instructions of all furniture components and hardware.
- C. Submit list of completed installations.
- D. Submit installers experience record.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect furniture during transit, delivery, storage and handling to prevent damage, soiling and deterioration. Deliver to jobsite in cartons or protective wrapping to prevent damage during installation. Do not deliver furniture until painting, wet work, grinding and similar operations which could damage, soil, or deteriorate furniture have been completed in installation areas. If furniture must be stored in other than installation areas due to unforeseen circumstances, store only in areas meeting requirements specified for installation areas.

1.5 JOB CONDITIONS

- A. The Installer shall examine the substrates and conditions under which the work is to be installed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. The Installer shall advise the Contractor of temperature and humidity requirements for furniture installation. Do not install furniture until the required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- C. Maintain temperature and humidity in installation area as required to maintain moisture content of installed furniture within a 1.0 percent tolerance of the optimum moisture content from the date of installation through the remainder of the construction period. Do not install, deliver, store furniture until building is fully enclosed, wet work is complete, and HVAC system is operating and will maintain a temperature between 60 and 90 degrees F and relative humidity between 17 and 50 percent (17% and 50%) during the remainder of the construction period. The furniture installer shall determine the optimum moisture content and required temperature and humidity conditions.

PART 2 PRODUCTS

2.1 Furniture shall be as follows. Provide furniture and accessories by manufacturer's listed. Other manufacturer's are acceptable upon submittal of substantiating data indicating compliance with the requirements of this Section, and review and approval by Architect. Equal manufacturers shall manufacture products of same style, quality, manufacturing construction techniques, materials, finishes, shapes, and sizes, as the products listed. Manufacturers wishing to provide equal products shall have similar experience record and manufacturing facilities as the companies listed.

- A. Bed and Accessories: Nittany Storage Platform Bed with a 3-drawer Bedbox and 28 inch drawers as manufactured by John Savoy and Son, Inc. , Montoursville, PA 17754. Tel: 800-233-8953. savoyfurniture.com
 - 1. Bed shall be factory modified Nittany Storage Platform Bed model number N-PPL8430-3DWR-28. 83 x 40 x 30H. Headboard 29 5/8 inches high including leveler. Footboard 17 3/8 inches high including leveler. Three (3) drawers 28 inches wide x 8 inches clear storage height x 29 3/8 inches wide with casters. Full length finger pulls. Drawers on right or left side of bed based on room configuration. Both configurations are required.
 - a. BEDSHLF wood bed shelf 35 inches x 8 inches x 10 inches hooks to end of bed.
 - 2. Bed quality specifications: Wood species oak, finish to be selected from full range of manufacturer's standards. Panel head and footboard 7 ply veneer core plywood panels. Wood side rails. 3/4 inch plywood mattress platform deck. Underbed full-length storage drawers, attached

to underside of bed with rail cleats. Casters on drawers for support. English dovetail drawers. Drawer fronts solid oak. Drawers solid 9 ply veneer core plywood with five sided drawer boxes. Drawer bottom 5 ply veneer core. 100 pound rated drawer slides. Full length finger pulls. Mortis and tenon joint construction, glued hardwood dowels, angled screws, cleats and glued corner blocks. MDF or fiberboard is not acceptable. 99 percent VOC free UV finish cleaned and sanded between coats.

3. Warranty: Lifetime limited warranty. Made in the USA.
4. Firehouse Mattress shall be manufactured by Derby Industries. 24350 SR 23 South, South Bend, IN 46614. Tel: 574-233-4500. derbyindustries.com
 - a. MEM603580 Firehouse Mattress 6 inches x 35 inches x 80 inches Pinnacle Hygienic Mattress Integrated Memory Foam Topper Firehouse Model. Fire retardant. Cover fabric acts as virus barrier. Cover is warrantied against cracking. Bleach solution cleanable. Zero Stitching.

B. Dining Table: Lincoln Collection Table as manufactured by Hi5 Furniture, Inc. 8301 NW 101st Terrace, Ste. 7, Kansas City Missouri. 64153 hi5furniture.com

1. Model Code : LNUT367229RES.L20. 36 inches x 72 inches x 29 inches high. Rectangle one piece HPL top 1.25 inch thick with solid L20 wood edge. Laminate Walnut Heights 7965K-12 with matching wood edge. Two (2) Stationary "rectangle framed" style bases on levelers with standoffs. One (1) AS: anti-sag factory installed steel bar attached to underside of table top. Bases Flag Red FRD.

C. Chair: Doni Wall Saver Leg Armless Solid Poly Chair as manufactured by KI, 1330 Bellevue Street, Green Bay, WI 54308-8100, 1-800-424-2432. ki.com

1. DNC 100 Doni Four - Leg Armless Wallsaver Poly Chair, Solid Color. Polypropylene Seat and Back Color to be selected. 22 1/4 inches w x 21 1/2 inches deep x 33 3/4 inches high. Poly finish and frame finish shall be selected from Manufacturer's full range of standard colors. 300 pound and 15 year warranty.
2. Specifications: Backrest, seat, and shroud are injection-molded polypropylene. The seat and backrest are joined by a pair of hidden articulation mechanisms, each consisting of a 14 gauge steel housing, twin 7 gauge levers and steel coil springs. The mechanism allows the backrest to recline up to 17 degrees. Legs are made from 7/8 inch O.D. x 13 gauge tubular steel. A single ring of 1/2 inch diameter steel wire forms the crossmember. All joints are welded. The wall saver configuration maintains 1/2 inch gap between the backrest and the wall. Frames are baked-on electrostatically applied 30 degree gloss epoxy

powder coat.

- D. Training Table: Portico Folding Base Table as manufactured by KI Furnishings, 1330 Bellevue Street, Green Bay, Wisconsin 54308-8100. Tel: 800-424-2432. ki.com
1. Training table with folding t-base. Finish to be selected from manufacturer's standard. Standard laminate top 24 inches x 96 inches with 1 1/2 inch vinyl bullnose edge 54B to be selected from manufacturer's standard.
 2. Base Construction: Folding mechanism is 11-gauge hot rolled black zinc plated steel. The folding mechanism releases and folds leg tightly to table bottom and securely locks with two injection molded polypropylene clips. When opened the legs engage into place for a tight, rigid fit between leg and mechanism. Locks are built of 10-gauge black zinc plated hot rolled steel and rotate into place with .075 diameter wire torsion springs. Mechanism utilizes a 1/4 inch diameter black zinc plated solid rivets in all pivoting joints. Legs pivots about a 5/8 inch diameter solid steel support rod. Built-in nylon bumpers keep table separated to prevent marring when tables are stacked.
 3. Top Construction: Portico tops consist of 1 1/8 inch thick high-density particle board core with a .020 inch high pressure laminate top and .020" phenolic backing sheet. 1 1/2 inch vinyl bullnose edge.
- E. Training Chair: Strive Sled Base Arm Chair as manufactured by KI, 1330 Bellevue Street, Green Bay, WI 54308-8100, 1-800-424-2432. ki.com
1. SSCAP Strive Sled Base Cantilever Arm Chair. Polypropylene chair color to be selected from Manufacturer's full range of standard colors. Powder coat frame color to be selected from Manufacturer's full range of standard colors. Glide type to be selected. 25 inches wide x 21 3/4 inches deep x 33 1/4 inches high. Flex back, recyclable materials, stacks, 300 pound and 15 year warranty.
 2. Specifications: Backrest is Injection-molded polypropylene with integral steel cantilever springs. Back is slotted. Springs are nominal 4.5 mm diameter chrome silicon valve spring wire. Seat and Shroud are injection-molded polypropylene. Legs are 7/8 inch O. D. X 13 gauge tubular steel. Cross members are 1 inch O.D. x 14 gauge tubular steel and 7/16 inch diameter solid steel. All joints are welded. Frame finish is baked-on electrostatically applied 30 gloss epoxy powder coating. Arms are cantilever. The supporting structure is a continuation of the rear leg finished to match the frame color. The arm caps match the seat and back color.
- F. Recliner: Firefighter Recliner as manufactured by Flexsteel Contract, 385 Bell Street, Debuque, IA 52001-7004. Mississippi Contact, Flexsteel 221 Industrial

Park Road, Starkville, MS 39759. 662-338-5481 flexsteel.com

1. Firefighter Recliner F289R-501. 41 inches wide x 44 inches deep x 47 inches high. Weight capacity 300 pounds minimum. Exceeds GSA test FNAE-80-214A for heavy duty use. High density foam. Three year warranty on the mechanism, frame, seat spring, and foam. Heavy duty firefighter's mechanism from Hickory Springs. Interior frame is hardwood with a metal seat box. Upholstery as selected from Flexsteel tip card Momentum Method D30-70 PVC-free, polyurethane, bleach cleanable, anti-microbial and anti-bacterial.
- G. Lounge Chair: Callaway Collection Lounge Chair as manufactured by Jasper Group Brands, 225 Clay Street, Jasper, Indiana 47547-0231, 800-622-5661. jaspergroup.us.com
1. Lounge Chair 6321D sled base chair 26 3/4 inches wide x 32 inches deep x 34 inches high. Seat width 24 1/2 inch, seat height 18 inch, arm height 24 inch. Wood species Oak / finish to be selected from full range of manufacturer's standards. Upholstery Maharam Milestone 403901 color 057 Coffee.
 2. Construction: All chair parts are constructed from solid wood. The arms, back posts, side rails and sled rails are fabricated from 1 1/2 inch lumber. The front and back rails are made from 1 1/2 inch lumber. All joints are connected with spiraled grooved, compressed hardwood dowels and assembly glue at each joint. All frames are reinforced with corner blocks which are properly fitted into the four corners of the seat frame and securely screwed and glued to the rails. For additional strength and stability, a steel screw is placed through each corner block and into the center of each adjoining leg. Interior seat construction consists of sheet webbing stretched and stapled securely to the seat frame. The seat is attached to the frame by four screws from the underside. The interior back construction consists of 3 1/2 inch wide strips of polypropylene webbing stretched and stapled to the back frame. The upholstered, non-removable, zippered back cushion is screwed to the frame from the back side.
 3. Finish: Each chair is sapped to uniform color as needed. Toner is used to give desired color to wood, applied in steps. Wash coat or a light sealer is applied to unit. Once the chair is dry, wash coat is sanded lightly to smooth standing wood fibers. Wipe stain is then applied, air dried, and then dried further in an oven. Color is checked prior to coat sealer being applied. Again the unit is air dried and dried further in an oven. Once cool, the unit is sanded, blown down, wiped clean and a final topcoat is applied. A final DuraTex topcoat is applied and air dried before going into the final oven.
 4. Upholstery: Each seat is upholstered with 3 1/4 inch high density polyurethane which is supported by high grade stretch webbing to

assure consistency and comfort. The back is upholstered with 5 1/2 inch high density polyurethane.

5. The Callaway Series is GreenGuard Certified.

H. Sofa: Callaway Collection Three Seat Sofa as manufactured by Jasper Group Brands, 225 Clay Street, Jasper, Indiana 47547-0231, 800-622-5661.

1. Three Seat Sofa 6323D sled base sofa 75 inches wide x 32 inches deep x 34 inches high. Seat width 72 1/2 inches. Seat Depth 20 inches. Seat height 18 inches. Arm height 24 inches. Wood species Oak / finish to be selected from full range of manufacturer's standards. Upholstery Maharam Oblique 466222 color 005. Apply up the roll.

2. Construction: All sofa parts are constructed from solid wood. The arms, back posts, side rails and sled rails are fabricated from 1 1/2 inch lumber. The front and back rails are made from 1 1/2 inch lumber. All joints are connected with spiraled grooved, compressed hardwood dowels and assembly glue at each joint. All frames are reinforced with corner blocks which are properly fitted into the four corners of the seat frame and securely screwed and glued to the rails. For additional strength and stability, a steel screw is placed through each corner block and into the center of each adjoining leg. Interior seat construction consists of sheet webbing stretched and stapled securely to the seat frame. The seat is attached to the frame by screws from the underside. The interior back construction consists of 3 1/2 inch wide strips of polypropylene webbing stretched and stapled to the back frame. The upholstered, non-removable, zippered back cushion is screwed to the frame from the back side.

3. Finish: Each sofa is sapped to uniform color as needed. Toner is used to give desired color to wood, applied in steps. Wash coat or a light sealer is applied to unit. Once the chair is dry, wash coat is sanded lightly to smooth standing wood fibers. Wipe stain is then applied, air dried, and then dried further in an oven. Color is checked prior to coat sealer being applied. Again the unit is air dried and dried further in an oven. Once cool, the unit is sanded, blown down, wiped clean and a final topcoat is applied. A final DuraTex topcoat is applied and air dried before going into the final oven.

4. Upholstery: Each seat is upholstered with 3 1/4 inch high density polyurethane which is supported by high grade stretch webbing to assure consistency and comfort. The back is upholstered with 5 1/2 inch high density polyurethane.

5. The Callaway Series is GreenGuard Certified.

I. Desk: Footprint and Modular L-Shaped Work Desk as manufactured by Kimball Office, 1600 Royal Street, Jasper, IN 47549, 800-482-1818.

1. Components: (1) 12S2415PUBBFM Footprint 24 inches d x 15 inches w x 27 inches high file pedestal with extended pull E, KRB random core lock, paint color Cloud. One (1) 99K1922CD Perks plastic center drawer, two (2) SS2496WSSW3 Footprint worksurface, with wire manager PF each surface, rim profile F, finish Color Monterey Oak, wire manager Chamois. One (1) IF2427F Metal Support End Panel paint color Cloud. Two (2) 12S2415PUFFM Footprint 24 inches d x 15 inches w x 27 inch high File Storage Pedestal with extended pull E, KRB random core lock, paint color Cloud. Three (3) FBG Footprint gusset bracket for end panel color Cloud. Two (2) IF1227WSP Footprint 12 inches deep x 27 inches high metal support panel paint color Cloud.
- J. Desk Chair: Synopsis as manufactured by Global Furniture Group, 17 West Stow Road, Marlton, NJ 08053, 800-220-1900. globalfurnituregroup.com.
1. 5081-4 Mid Back Tilter Chair. Adjustments include tilt tension, pneumatic seat height adjustment, chair tilt lock, and center tilt action. Adjustable arms are height and width adjustable. Overall dimensions 24.5 inches wide x 26.5 inches deep x 43.5 inches high. Upholstery Momentum Canter color Storm CE64. 5 star injection molded base. Base and arms are black. Carpet casters.
 2. Warranty: All commercial products are free from defects in material and workmanship, for the life of the product, to the original purchaser. Global will repair or replace, at Global's option, as the sole remedy for any defect covered by the warranty. General commercial seating warranty covers all chair components including pneumatic cylinders, bases, casters, frames, arms, and other structural components. Foam and textiles are warranted for five years. Control mechanisms are warranted for twelve years. This is a standard 40 hour per week user warranty for users weighing up to 300 pounds.
- K. Media Storage Cabinet: Media Cabinet as manufactured by John Savoy and Son, Inc. , Montoursville, PA 17754. Tel: 800-233-8952. savoyfurniture.com
1. N-4D2C6024MC Media Storage Cabinet with 4 Drawers, 2 Open Compartments, no backsplash 60 inches x 24 inches x 33 inches. Oak. Finish to be selected from Manufacturer's full range of oak finishes.
- L. Bar Stool: Atoll Barstool as manufactured by Grand Rapids Chair Company, 1250 84th St. SW. Byron Center, MI 49315. 616-774-0561. grandrapidschair.com
1. 400BS Atoll Bar Stool. Fully welded steel frame. 1.25 inch metal tube frame. Upholstered seat with 2" of high resilience foam. Nylon Glides 16.75 inches x 16.75 inches x 30 inches high. Upholstery Momentum Canter color Nimbus graded in. Metal finish to be selected from

manufacturer's full range of standard metal options.

2.2 FINISHES

- A. Color of all exposed and semi-exposed surfaces to be selected by Architect.

PART 3 EXECUTION

3.1 PREPARATION

- A. Condition furniture to average prevailing humidity conditions in installation areas prior to installing.

3.2 INSTALLATION

- A. Install furniture plumb, level, true in locations indicated and/or as directed by Architect.

3.3 PROTECTION

- A. Protect installed furniture until substantial completion of the work of the project.

3.4 ADJUSTMENT, CLEANING, FINISHING

- A. Remove protective coverings at substantial completion for final inspection.
- B. Repair damaged and defective furniture wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace furniture work. Adjust joinery for uniform appearance.
- C. Clean hardware, lubricate and make final adjustments for proper operation. Clean furniture on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.
- D. The Installer of furniture shall advise the Contractor of final protection and maintenance conditions necessary to ensure that the work will be without damage or deterioration at the time of acceptance.

END OF SECTION

SECTION 15011

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED:

- A. Materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:
 - 1. Mechanical work covered by all sections within DIVISION 15 - MECHANICAL of these Specifications, including but not limited to:
 - a. Plumbing systems and equipment.

1.2 SUMMARY OF RELATED WORK AND APPLICABLE REQUIREMENTS SPECIFIED ELSEWHERE:

- A. Divisions 0 and 1 - CONTRACT REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to all work included in this section. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this and the other sections of Division 15.
- B. This section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Reference Standards, Codes and Fees
 - 2. Quality Assurance
 - 3. Submittal
 - 4. Maintenance Manuals
 - 5. Job Conditions
 - 6. Accuracy of Data and Drawings
 - 7. Electrical Requirements for Mechanical Equipment
 - 8. Coordination Drawings
 - 9. Record Documents
 - 10. Identification
 - 11. Fire-Stop Materials
 - 12. Rough-ins
 - 13. Field Tests
 - 14. Excavation and Backfill
 - 15. Adjusting and Cleaning
 - 16. Installation
 - 17. Removal and Relocation of Existing Work
 - 18. Painting
- C. Related Work:
 - 1. DIVISION 3 - CONCRETE.
 - 2. DIVISION 5 - METALS.

3. DIVISION 9 - FINISHES.
4. DIVISION 16 - ELECTRICAL.

1.3 REFERENCE STANDARDS, CODES AND FEES:

- A. In addition to requirements of Divisions 0 and 1 - CONTRACT REQUIREMENTS and GENERAL REQUIREMENTS; install work to comply with requirements of:
 1. Local Codes
 2. International Building Codes
 3. State Codes
 4. International Fire Prevention Code
 5. Federal Codes
 6. ASME Boiler Code
 7. AGA - American Gas Association
 8. NEMA - National Electrical Manufacturer's Association
 9. ANSI - American Society National Standards Institute
 108. ASME - American Society of Mechanical Engineers
 11. NFPA - National Fire Protection Association
 12. NFPA - 101 Life Safety Code
 13. UL - Underwriters Laboratories, Inc.
 14. OSHA - Occupational Safety and Health Act
- B. The Contractor shall obtain and pay for all licenses and permits required to perform work covered by DIVISION 15 - MECHANICAL, and obtain and pay for all necessary inspections by all applicable authorities.

1.4 QUALITY ASSURANCE:

- A. The use of manufacturer's names and catalog numbers in these specifications or on the drawings indicates the type, size, rating, capacity, design, quality, or kind of materials required and a closed specification is not intended, and similar and equal products of any reputable manufacturer which will satisfactorily perform the required functions will be acceptable, unless otherwise indicated by the words NO SUBSTITUTES, or unless otherwise specifically stated. The Architect/Engineer reserves the right to reject all materials which he deems not equal to those specified, or which he decides will not satisfactorily perform the required functions.
- B. Supply all equipment and accessories new and free from defects.
- C. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- D. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with all applicable national, state, and local codes.
- E. When included, reflected ceiling plan drawings shall govern over mechanical and electrical drawings for location of ceiling-mounted elements.

- F. In addition to all requirements specified hereinafter, each material and equipment item shall have all features as standard with its manufacturer and/or required for the complete operational system.
- G. Capacities, ratings, sizes and other requirements not specified hereinafter shall be as scheduled or otherwise indicated on the drawings.
- H. Should the Trade Contractor at any time discover a discrepancy between engineering and architectural drawings or with respect to a variance of code requirements, he shall notify the Architect/Engineer for clarification and shall not proceed with the work affected until clarification has been made.

1.5 SUBMITTALS:

- A. Submittals and shop drawings shall be submitted in accordance with Divisions 0 and 1 - CONTRACT REQUIREMENTS and GENERAL REQUIREMENTS and in accordance with the following.
 - 1. Carefully review the requirements of DIVISIONS 0 and 1.
 - 2. All equipment, material, and manufacturer's literature shall be submitted for approval at one time and in a tabulated high quality 3 ring binder. Control drawings and the controls equipment submittal may be submitted at a later time, but as soon as practical after the contract has been awarded and after the general equipment submittal has been made. However, every attempt shall be made to include the complete controls submittal with the general equipment submitted at one time.
 - 3. The submittal shall include summary cover sheet(s) and manufacturer's literature under each tab of the submittal binder which together clearly indicate compliance or deviation from the specifications and drawings. Each submittal brochure shall be signed on the index page by the Contractor. This signature shall indicate the Contractor has examined all data therein and found same to be in order.
 - 4. Submission material and all shop drawings shall be marked up with the appropriate identification relating the equipment to the drawings. Mark and reference each item on the submittal summary sheet and the manufacturer's literature to the appropriate paragraph number in the specifications. Manufacturer's standard catalogs will not be accepted.
 - 5. Failure to comply with the above for a complete and clear submittal will result in resubmittal.
 - 6. A minimum of (7) copies of all submittals shall be provided of which (3) will be returned to the Owner by the Contractor, (2) will be retained by the A/E, and (2) will be available for Contractor's use.
- B. Maintenance Manuals:
 - 1. Prepare maintenance manuals in accordance with Division 1 Section "CLOSEOUT SUBMITTALS." In addition to the requirements specified in Division 1, include the following information for each equipment item. Behind a separate tab for each piece of equipment, provide the following:

- a. A copy of the equipment submittals and shop drawings as provided in (A) above.
 - b. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - c. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions, as applicable.
 - d. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - e. Servicing instructions and lubrication charts and schedules.
2. Before requesting acceptance of work, furnish the number of printed and bound sets required in DIVISIONS 0 and 1.
 3. Detailed and simplified one line, color coded flow and wiring diagrams.
 4. Schedule of valve identification.
 5. Provide seven (7) copies of all manuals.

1.5 JOB CONDITIONS:

- A. Examine related work and surfaces before starting work of any section.
 1. Report to Architect/Engineer, in writing, conditions which will prevent proper provision of this work.
 2. Installed work which interferes with architectural or any other work, or which deviates from drawings and specifications without Architect's prior approval, shall be altered by DIVISION 15 - MECHANICAL, without cost to the Owner, to clear such interferences, or to comply with the drawings and specifications. Interferences or discrepancies which may be discovered or anticipated shall be reported promptly to Architect for his decision before proceeding with the work involved. Architect shall have privilege of making minor changes without additional cost, provided that such changes are made before commencing work on items involved.
- B. Continuity of Services and Connections to Existing Work:
 1. At no additional cost to the Owner, provide all necessary temporary connections and temporary facilities to accomplish the required continuity of services and existing operations.
 2. Arrange all work to interfere as little as possible with the normal existing operations. Do not interrupt any existing utility or other service or existing operation at any time without Owner's prior approval. After each interruption has been made, make all necessary connections and alterations and restore services and avoid interferences with normal existing operations as quickly as possible.

3. Install new work and connect to existing work with minimum interference to existing facilities and maintain water and air tightness when applicable.
4. Temporary shutdowns of existing services:
 - a. At no additional charges.
 - b. At times not to interfere with normal operation of existing facilities.
 - c. Only with written consent of Owner.
5. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.
6. Connect new work to existing work in neat and satisfactory high quality workmanship manner.
7. Restore existing disturbed work to original or better conditions.

1.6 ACCURACY OF DATA AND DRAWINGS:

- A. Drawings are generally diagrammatic, and where not dimensioned or detailed, indicate approximate locations of work. Examine carefully existing buildings and structures, existing systems, and all other contract drawings, and install work to conform as nearly as possible to locations and arrangements indicated, with only such minor adjustments as necessary to coordinate work with architectural and other work, and to avoid interferences therewith. All piping and ductwork, offsets, risers, and fittings are not necessarily shown; however, provide these as required by the conditions involved.
- B. Building and structure dimensions: TAKE THESE FROM ARCHITECTURAL AND STRUCTURAL DRAWINGS.

1.7 ELECTRICAL CHARACTERISTICS, MOTOR SIZES, MOTOR STARTERS, CONTROLS, AND WIRING:

- A. DIVISIONS 0 and 1 - CONTRACT REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to the work related in this section.
- B. Motor starters and other electrical control devices: Generally, motor starters for equipment motors shall be furnished by DIVISION 16 - ELECTRICAL; however, this section shall furnish ONLY those motor starters which may be specified hereinafter in this Section. Also, this section shall furnish all other electrical control devices required for the Mechanical system, unless otherwise specified.
- C. Installation of electrical devices, EXCEPT those factory mounted on equipment: electrical control devices which require electrical connections ONLY, shall be installed by DIVISION 16 - ELECTRICAL. All control devices which are not factory mounted on the equipment and require piping, linkage, remote bulb, or other mechanical connections as well as electrical connections shall be installed by the Section that furnished the equipment involved, ready for electrical connection.
 1. Electric wiring: Coordinate with Electrical Division 15 shall perform any and all control and interlock wiring necessary for the operation sequence described on

mechanical plans with properly licensed personnel. Any wiring requirements for control devices furnished under Division 15 shall be provided by Division 15.

Wiring for control devices not furnished by Division 15 or devices that are factory mounted on mechanical equipment requiring electrical connections only shall be by Division 16. Division 16 shall provide dedicated 120 VAC, 15-20 amp power to designated control panel locations. Exact locations shall be coordinated between Division 15 and 16.

2. All necessary interlocking contacts and remote starting contacts and remote starting devices not installed on local control panels shall be supplied with the starters and it shall be the responsibility of Division 15 to coordinate the number of contacts required. If individual control transformers are required, provide the transformers necessary for the additional power required by auxiliary control devices. This coordination shall occur prior to ordering starters and the cost shall be included in the bid proposal.
3. Control wiring materials and installation shall conform to Division 16 requirements.

1.8 COORDINATION DRAWINGS:

- A. Prepare coordination drawings in accordance with Division 1 Section 00802 "SUPPLEMENTARY CONDITIONS", to a minimum scale of 1/4" = 1'- 0" or larger if required in Division 1; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work, including (but not necessarily limited to) the following:
 1. Indicate the proposed locations of piping, equipment, and materials in all mechanical equipment rooms [and 20 feet in all directions of mechanical chase(s)]. Include the following:
 - a. Clearances for installing and maintaining insulation.
 - b. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - c. Equipment connections and support details.
 - d. Exterior wall and foundation penetrations.
 - e. Fire-rated wall and floor penetrations.
 - f. Sizes and location of required concrete pads and bases.
 2. Project drawings for mechanical and plumbing systems shall be made available to the contractor in Autocad format for use in coordination drawings.

1.9 RECORD DOCUMENTS:

- A. Prepare record documents in accordance with the requirements in Division 1 Section "CLOSEOUT SUBMITTALS." In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. All piping with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.) Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
4. Contract Modifications, actual equipment and materials installed.
5. These documents shall be prepared in Autocad format and provided with project closeout documentation in disk and hard copy format.

PART 2 PRODUCTS

2.1 VALVE TAG IDENTIFICATION:

- A. Minimum 1-1/2 inch diameter.
- B. Brass or aluminum.
- C. Identifying numbers and letters shall be stamped 1/4 inch (minimum) height.
- D. Fasten to valve with 18 (minimum) gauge solid copper or galvanized steel wire.

2.2 NAME PLATE IDENTIFICATION:

- A. Four by two inch (minimum) size engraved and laminated plastic nameplate or black lamicaid sheet with white lettering.

2.3 PIPE IDENTIFICATION:

- A. Pipe identification shall be [Brady B-946 or equal self-sticking vinyl cloth markers and pipe marker arrows] [plastic snap-around arrows and pipe markers equal to Seton "Set Mark"].

2.4 WARNING TAPE FOR BURIED PIPE:

- A. Tape shall be Reef Industries, Inc., "Terra Tape D", Seton Detection Tape or as approved, composition metalized foil-plastic film laminate bearing imprint describing the type of buried pipeline.
- B. All materials shall be specifically formulated for prolonged use underground.

2.5 FIRE-STOP MATERIALS:

- A. All pipes and conduit penetrating fire-rated partitions (walls, floors, ceilings) shall be properly sealed with fire-stop material so as to achieve the same fire rating for the penetration as the partition carries. The fire-stop material shall be Factory Mutual approved, UL classified, and shall provide a cold smoke and water seal. When exposed to heat, the material shall rapidly expand to seal any cavities in the penetration or opening. Under continuous exposure to high heat, the intumescent materials shall form a high-strength insulating barrier that seals out fire, toxic fumes, and smoke for up to three hours.
- B. These fire stop materials shall be applied in the form of sheets (wrap) and/or caulk and putty, as the situation requires.
- C. Fire-stop materials shall be 3M Brand Fire Barrier products, or approved equal.

PART 3 - EXECUTION

3.1 ROUGH-IN:

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 FIELD TESTS:

- A. All piping shall be free of leaks, and test gauges shall show no loss of pressure for at least 30 minutes, after source of test pressure has been cut off, or as noted. Pipes may be tested in sections as the work progresses. Repair and retest all sections failing to pass tests, as required to obtain approval of tests. No caulking, welding or brazing will be permitted on threaded pipe or fittings to stop leaks. Replace with new material all cracked or otherwise defective pipe and fittings of all types, as approved. Furnish suitable testing equipment, give the Architect/Engineer and all applicable authorities ample advance notice of all proposed tests and readiness of work for inspections, and conduct each test in their presence, as approved. Do not conceal or insulate piping until all inspections have been made and all required tests have been approved by the Architect/Engineer and all applicable authorities. Submit results for review.
- B. Provide required labor, material, equipment and connections.
- C. Test all piping, EXCEPT as otherwise specified below, as follows: hydrostatic test, at 150 percent of normal operating pressure of piping involved, or 100 psi, whichever is higher, AFTER removing all air from piping involved in test.

1. Natural gas piping: 60 psi test using air proving pipe is tight for a period as directed by local inspection authority.
2. Soil, waste, vent roof drainage and domestic water piping: Shall be tested as specified in Section 15400.
3. Test all equipment in accordance with sections specified hereinafter.

3.3 EXCAVATION AND BACKFILL:

A. Excavation, Underground Pipework:

1. Cut trenches to indicated and/or required lines, and to depths which will:
 - a. Provide full length bearing of pipe barrels on firm ground.
 - b. Provide 24 inch MINIMUM earth cover over all pipes outside of buildings and structures.
2. Piping shall be laid on a six inch bed of sand and backfilled with 12 inches of sand in six inch layers.
3. Seat pipe on sand fill as required to facilitate jointing, and to prevent pipe hubs, couplings and valves from bearing on sand before backfilling.
4. Sheet and brace excavations as required to prevent cave-ins and protect personnel and adjacent structures.
5. Where pipelines are below footings, horizontal distance between footings and pipelines shall be as required to provide not steeper than a 1:1 slope from footing bottoms to trench bottoms at all points.

B. Backfill, Trenches:

1. After each pipeline has been laid, tested and approved, thoroughly hand tamp backfill into bell holes, around pipe, and up to six inches above pipe top.
2. Place remaining backfill in 8 inches maximum thickness loose layers, and with pneumatic or other suitable power tampers compact each layer to the backfill density specified in Section 02200 - EARTHWORK.
3. Backfill materials shall be of the following types:
 - a. Up to six inches above pipe tops: sand, ONLY.
 - b. From six inches above pipe tops up to finished grade or subgrade, as required:
 - 1) Any materials removed from the excavation and suitable for backfill, except do not use as backfill material any pieces of the following material which are larger than six inches in their greatest dimensions: rock, stone, concrete, asphalt paving, or masonry.
 - 2) Dispose of excavated materials which are not replaced as backfill, as approved.

C. Excavation and Backfill for Structures Related to Mechanical Work:

1. This shall conform to applicable requirements in Section 02200 - EARTHWORK.

D. Unsuitable Subsurface Conditions:

1. Where excavation bottoms at required elevations are found to be unstable, or where rock, cinders, rubbish, or other deleterious materials are encountered, extend excavations down to firm earth, but at least six inches below deleterious materials.
2. Bring excavation bottoms back up to required pipe laying subgrade by backfilling with suitable material, thoroughly compacted in place as specified above.
3. "Suitable material" shall be as specified above.
4. Dispose of excavated unsuitable subgrade materials, as approved.

E. Warning Tape for Buried Pipeline: Install detectable warning tape directly over every exterior pipeline by burying tape as close to the surface as possible, but no less than six inches beneath finished grade.

3.4 ADJUSTING AND CLEANING:

- A. Flush or blow all welding slag, pipe joint compound, loose scale, and other debris from pipework before connecting equipment thereto.
- B. After systems have been tested and before any field painting is commenced, clean up all work thoroughly. Remove all foreign matter which has accumulated in ducts, casings, enclosures, fixtures, and equipment. Clean and polish all valves, plates, and other surfaces that are not to be painted, so that they present a new and acceptable appearance.
- C. Put systems in operation, test all fixtures and other equipment, remedy all leaks and defects, make all necessary adjustments, and remove all air from water circulating systems. Adjust all air and water flows to indicated and/or required quantities, and adjust all controls and other items as required to balance system and provide uniform air flows and uniform temperatures in air conditioned areas. Demonstrate that all controls and mechanical equipment function satisfactorily, as specified, as indicated, and as approved.
- D. Sterilization of Domestic Water System: AFTER all water connections have been made to all fixtures and equipment, and BEFORE plumbing system is used by Owner, sterilize entire potable water system as specified below, and submit a written report certifying that this has been done in accordance with the requirements of the State Department of Public Health.
 1. Drain entire water system.
 2. Refill entire water system with a sterilizing solution of potable water containing at least 50 parts per million of available chlorine.
 3. Allow sterilizing solution to remain in water system for at least 24 hours, then drain all sterilizing solution from water system.
 4. With potable water, flush all traces of sterilizing solution from entire water system through each fixture and each water outlet.

- E. Strainers and Dirt Pockets: Clean out each of these; REMOVE EACH STRAINER SCREEN FOR CLEANING. Initially install very fine mesh screen for system cleaning and operate System to a minimum of 24 hours. Remove screen, clean it and replace it in system until a clean system is verified. Remove screen and replace with screen at mesh for normal operation.
- F. Circulating Water Systems: Completely drain each of these, and refill with clean water.
- G. After systems have been tested and before putting any part of or the entire system in operation for Owner's beneficial use, insure that all necessary adjustments have been made.
 - 1. Bearings and other items requiring lubrication, except factory permanently lubricated type: lubricate each of these as recommended by its manufacturer; this includes lubricated type plug valves.
 - 2. Belts: adjust each of these to proper tension.
 - 3. Filters: replace each disposable ("throw away") filter with a new clean filter (except blanket roll and high efficiency type). Clean each cleanable filter. NOTE: ALL FILTERS SHALL BE IN PLACE DURING TESTING AND ADJUSTING AND SHALL BE CLEAN.
 - 4. Motor load tests: make an ammeter check of actual running current of each motor in mechanical system under operating conditions. Correct all motors that are found to be overloaded, as approved.

3.5 INSTALLATION:

- A. General: Sequence, coordinate and integrate the various elements of mechanical systems, materials, and equipment.
- B. Equipment rooms and other areas in which equipment is to be installed have limiting dimensions. Coordinate mechanical systems, equipment, and materials installation with other building components. Install all mechanical work within these areas substantially as indicated, with ample unobstructed access space around each piece of equipment to facilitate proper installation, operation, and maintenance of equipment, and to allow ample space for plumbing, electrical, and other equipment indicated to be installed therein. Minor revisions in layout may be made subject to Architect/Engineer approval, but major changes in layout to accommodate proposed equipment which differs substantially from specified equipment in size and arrangement will not be considered. Each bidder shall determine before bidding that equipment upon which he proposes to base his bid will conform to these requirements. Install each equipment item in accordance with its manufacturer's recommendations, and as indicated on the drawings, and/or specified. If the drawings and/or specifications conflict with the manufacturer's recommendations, report this to the Architect/Engineer for his decision before proceeding with the work involved.
- C. Equipment NOT furnished by mechanical section but requiring mechanical connections from other Sections and others furnishing this equipment, determine exact

mechanical connection requirements therefor; locations and arrangements of connections indicated for this equipment are APPROXIMATE ONLY.

- D. Arrange for chases, slots and openings in other building components during progress of construction, to allow for mechanical installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where installation heights are not detailed or dimensioned, and equipment requires periodic service, verify height with Owner and/or Architect prior to installation, otherwise install to provide the maximum headroom possible.
- H. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.
- I. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- J. Install systems, materials and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.6 PAINTING:

- A. All surfaces shall be left clean and free from oil.
- B. All equipment shall be factory prime coated and painted; however, the following may be shop prime coated and made ready for painting:
 - 4. Tanks.
 - 5. Structural supports and frames.
- C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.
- D. Uncoated Hangers, Supports, Rods, and inserts shall be prime coated.
- E. Exposed, uninsulated black steel piping, pipe supports, and pipe braces shall be prime coated.
- F. Marred surfaces of prime coated or factory painted surfaces shall be painted and/or primed to match adjacent coat.

- G. Provide enamel paint where items are specified to be painted.

3.7 IDENTIFICATION OF VALVING AND EQUIPMENT:

- A. Identify valves, (including main pipe sectionalizing valves and branch valves) except those on or within hand reach of equipment controlled thereby with a minimum 1-1/2 inch diameter round brass or aluminum tag stamped with 1/4 inch (minimum) height letters designating material controlled by valve, and attached to valve body with 18 (minimum) gauge solid copper or galvanized steel wire. Submit a typed valve identification schedule with the operating instructions and parts list submittal described above under 1.5 SUBMITTALS.
- B. Equipment: Label each major mechanical equipment item (such as water heaters, etc.) with nameplate engraved with equipment designation and number, and securely attached to equipment

3.8 IDENTIFICATION OF PIPING:

- A. Identify piping with each marker sized as recommended by manufacturer for outside diameter of pipe (including pipe insulation) labeled therewith. Marker background colors shall conform to OSHA, NFPA and ANSI pipe identification standards as scheduled in Table (I). Each pipe marker shall be lettered to indicate the material contained in the pipeline involved and arrows shall indicate direction of material flow in the pipelines.
- B. Provide a full color piping Identification Schedule indicating material type within pipe and its corresponding color coding.
- C. Locate Identification As Follows:
 - 1. Mechanical Equipment Rooms:
 - a. Within 1'-6" of each valve or valve assembly.
 - b. Within 3'-0" of each 90 degree elbow, connection to equipment or vessel, point where pipe enters shafts and pierces outside walls.
 - c. On not over 20'-0" intervals along all exposed piping.
 - 2. Above Suspended Ceilings:
 - a. Within 1'-6" of each valve or valve assembly.
 - b. At tees within 3'-0" of both main and branch.
 - c. Within 3'-0" of each 90 degree elbow.
 - 3. Piping Concealed in Chases or Shafts:
 - a. Each pipe visible through an access door or panel.

4. Piping Exposed in Rooms Other than Mechanical Equipment Areas:
 - a. Omit identification of piping, 2" and smaller, exposed at connections to equipment or plumbing fixtures.
 - b. With the above exception, identify at not less than (1) point each piping run visible in each room with identification on not over 20'-0" intervals.

TABLE I
SCHEDULE OF PIPING IDENTIFICATION

<u>CLASSIFICATION</u> (Per ANSI A13.1)	<u>BACKGROUND COLOR</u>	<u>LETTERING</u>
Domestic Cold Water	Green	White
Domestic Hot Water Supply	Yellow	Black
Equipment Drains, Roof Drains	Green	White
Sanitary Drains, Storm Drains	Green	White
Plumbing Vent Lines	Green	White
Natural Gas	Yellow	Black

3.7 FIRE-STOP MATERIALS:

- A. Seal around all pipes and conduit penetrating fire-rated partitions, in accordance with manufacturer's instructions. Caulk and putty shall be applied to the proper depth for the fire rating required, as listed in the manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS**2.1 GENERAL MOTOR REQUIREMENTS**

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.

- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.

- 3. Capacitor start, inductor run.
- 4. Capacitor start, capacitor run.

- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

- D. Motors 1/20 HP and Smaller: Shaded-pole type.

- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 15061

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.
 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel>.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment support.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09912 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

- 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS**A. Structural Performance:** Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 ACTION SUBMITTALS**A. Product Data:** For each type of product indicated.**B. Shop Drawings:** Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.**1.4 INFORMATIONAL SUBMITTALS****A. Welding certificates.**

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa)] minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa)] minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

- c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
- 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
- 5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 15072 VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Isolation mounts.
 - 3. Restrained elastomeric isolation mounts.
 - 4. Restraining braces.

1.2 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC C.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: IV.
 - a. Component Importance Factor: 1.5.
 - b. Component Response Modification Factor: 3.25.
 - c. Component Amplification Factor: 2.5.

1.4 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ace Mountings Co., Inc.
 - 2. Amber/Booth Company, Inc.
 - 3. California Dynamics Corporation.
 - 4. Isolation Technology, Inc.
 - 5. Kinetics Noise Control.
 - 6. Mason Industries.
 - 7. Vibration Eliminator Co., Inc.
 - 8. Vibration Isolation.
 - 9. Vibration Mountings & Controls, Inc.
- B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
 - 1. Resilient Material: Oil- and water-resistant neoprene.
- C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled,

encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four] times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

- E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- G. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127 and NFPA 13.
 - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 3. Brace a change of direction longer than 12 feet (3.7 m).
- C. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.2 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 15375 "Wet-Pipe Fire-Suppression Sprinklers" for piping flexible connections.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Freestanding and restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restraining braces and cables.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Velocity: **120**
2. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the 2012 IBC: **D**
2. Seismic Design Category: **C**
3. Assigned Seismic Use Group or Building Category as Defined in the IBC: **IV**
 - a. Component Importance Factor: **1.5**
4. Design Spectral Response Acceleration at Short Periods (0.2 Second): **$S_{DS} = 0.373$**
5. Design Spectral Response Acceleration at 1-Second Period: **$S_{D1} = 0.213$**

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria,

including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Welding certificates.
- D. Qualification Data: For professional engineer.
- E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
 - 1. Resilient Material: Oil- and water-resistant [neoprene] [rubber] [hermetically sealed compressed fiberglass].
- B. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
 - 1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

- C. Restrained Mounts: All-directional mountings with seismic restraint.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- E. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- F. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
 2. Base: Factory drilled for bolting to structure.
 3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch (6-mm) travel up or down before contacting a resilient collar.
- G. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

- H. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
- I. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
- J. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.
- K. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- C. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- D. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- G. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- B. Equipment Restraints:
 - 1. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
 - 3. Brace a change of direction longer than 12 feet (3.7 m).
- D. Install cables so they do not bend across edges of adjacent equipment or building structure.
- E. Install seismic-restraint devices using methods approved by OSHPD an agency acceptable to authorities having jurisdiction providing required submittals for component.
- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- H. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the

connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 23 Section "Hydronic Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least three of each type and size of installed anchors and fasteners selected by Engineer.
 - 5. Test to 90 percent of rated proof load of device.
 - 6. Measure isolator restraint clearance.
 - 7. Measure isolator deflection.
 - 8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

1.2 ACTION SUBMITTAL

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

PART 2 - PRODUCTS**2.1 EQUIPMENT LABELS****A. Metal Labels for Equipment:**

1. Material and Thickness: Brass, 0.032-inch (0.8-mm), Stainless steel, 0.025-inch (0.64-mm), Aluminum, 0.032-inch (0.8-mm), anodized aluminum, 0.032-inch (0.8-mm)] minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Green.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Chilled-Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 2. Condenser-Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 3. Heating Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: White.
 - 4. Refrigerant Piping:
 - a. Background Color: Blue.

- b. Letter Color: White.
- 5. Low-Pressure Steam Piping:
 - a. Background Color: Orange
 - b. Letter Color: White.
- 6. High-Pressure Steam Piping:
 - a. Background Color: Red
 - b. Letter Color: White.
- 7. Steam Condensate Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 25 feet (7.5 m) in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION

SECTION 15083

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
 - 1. Division 7 Section "Firestopping" for firestopping materials and requirements for penetrations through fire and smoke barriers.
 - 2. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
 - 2. Attachment and covering of heat trace inside insulation.
 - 3. Insulation application at pipe expansion joints for each type of insulation.
 - 4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Removable insulation at piping specialties and equipment connections.
 - 6. Application of field-applied jackets.
- C. Samples: For each type of insulation and jacket. Identify each Sample, describing product and intended use. Submit Samples in the following sizes:
 - 1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN50).
 - 2. Sheet Form Insulation Materials: 12 inches (300 mm) square.
 - 3. Jacket Materials: 12 inches (300 mm) long by NPS 2 (DN50).
 - 4. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.

- D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups according to the following requirements, using materials indicated for the completed Work:
 - 1. Include the following mockups:
 - a. One 10-foot (3-m) section of NPS 2 (DN50) straight pipe.
 - b. One 90-degree elbow.
 - c. One tee fitting.
 - d. One NPS 2 (DN50) valve.
 - e. Four support hangers, including hanger shield and insert.
 - f. One strainer with removable portion of insulation.
 - g. One reducer.
 - 2. Build mockups with cutaway sections to allow observation of application details for insulation materials, mastics, attachments, and jackets.
 - 3. Build mockups in the location indicated or, if not indicated, as directed by Architect.
 - 4. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 5. Obtain Architect's approval of mockups before starting insulation application.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed.

8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for insulation application.
- C. Coordinate installation and testing of steam or electric heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.
 2. Cellular-Glass Insulation:
 - a. Pittsburgh-Corning Corp.
 3. Flexible Elastomeric Thermal Insulation:
 - a. Armstrong World Industries, Inc.
 - b. Rubatex Corp.

2.2 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
 2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
 3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
 6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
 7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
 2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.
- C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
1. Adhesive: As recommended by insulation material manufacturer.
 2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- D. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
 2. PVC Jacket Color: White or gray.
 3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system.
- D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.
1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 2. Adhesive: As recommended by insulation material manufacturer.

2.4 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
 2. Galvanized Steel: 0.005 inch (0.13 mm) thick.
 3. Aluminum: 0.007 inch (0.18 mm) thick.
 4. Brass: 0.010 inch (0.25 mm) thick.
 5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.
- C. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

2.5 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

2.6 ENCLOSURES

- A. Stainless steel, dual-capacity, above ground, heated enclosure, complying with ASSE 1060. Unit shall be capable of housing (2) 4" backflow preventers.
- B. Provide with (2) 1000 W unit heaters (120/1/60).
- C. Mount on 4" thick concrete pad. Coordinate with structural.
- D. Provide with removable access panels on both sides of enclosure. Each access panel shall have lockable handles.

- E. Basis of Design: Hubbell Hox Box HB3E-D.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
1. Apply insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- O. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
 2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
 4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
1. Seal penetrations with vapor-retarder mastic.
 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal metal jacket to roof flashing with vapor-retarder mastic.
- Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

- R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."
- T. Floor Penetrations: Apply insulation continuously through floor assembly.
 - 1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
 - 2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
 - 3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
 - 4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
 - 1. Apply preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 - 4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.
- C. Apply insulation to fittings and elbows as follows:
 - 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 - 2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
 - 3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.

2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.7 FIELD-APPLIED JACKET APPLICATION

- A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
 1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
 3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
- B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.
 1. Draw jacket material smooth and tight.
 2. Apply lap or joint strips with the same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.
- C. Apply PVC jacket where indicated, with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
- D. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.8 FINISHES

- A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.9 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Flexible connectors.
 - 2. Vibration-control devices.
 - 3. Fire-suppression piping.
 - 4. Drainage piping located in crawl spaces, unless otherwise indicated.
 - 5. Below-grade piping, unless otherwise indicated.
 - 6. Chrome-plated pipes and fittings, unless potential for personnel injury.
 - 7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 FIELD QUALITY CONTROL

- A. Inspection: Engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
 - 1. Inspect fittings and valves randomly selected by Architect.
 - 2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
 - 3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.
- B. Insulation applications will be considered defective if sample inspection reveals non-compliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.11 INSULATION APPLICATION SCHEDULE, GENERAL

- A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.
- B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
- B. Related Sections:
 - 1. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS**2.1 INSULATION MATERIALS**

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of

Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Products: Subject to compliance with requirements, available products that may be
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 - 5. Color: Aluminum.
 - 6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements.
2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches (75 mm).
2. Thickness: 6.5 mils (0.16 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches (50 mm).
2. Thickness: 3.7 mils (0.093 mm).
3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.8 SECUREMENTS

- A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 3/4 inch (19 mm) wide with wing seal or closed seal.

- B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
 - b. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).

- c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
- 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel or aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- D. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.

2.9 CORNER ANGLES

- A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.

- f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
 5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from

- insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.6 FINISHES

- A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.

7. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches (50 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.
- B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches (50 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.
- C. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches (50 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.
- D. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches (50 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.

END OF SECTION

SECTION 15091

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Advance Products & Systems, Inc.
 2. CALPICO, Inc.
 3. Metraflex Company (The).
 4. Pipeline Seal and Insulator, Inc.
 5. Proco Products, Inc.

- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07920 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07841 "Through-Penetration Firestop Systems."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6 (DN 150): PVC-pipe sleeves.

END OF SECTION

SECTION 15110

PLUMBING VALVES

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 general-duty valves:
 - 1. Bronze angle valves.
 - 2. Copper-alloy ball valves.
 - 3. Bronze check valves.
 - 4. Gray-iron swing check valves.
 - 5. Spring-loaded, lift-disc check valves.
 - 6. Bronze gate valves.
 - 7. Bronze globe valves.
 - 8. Resilient-seated, cast-iron, eccentric plug valves.
- B. Related Sections include the following:
 - 1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
 - 2. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:
 - 1. CWP: Cold working pressure.
 - 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 3. NBR: Acrylonitrile-butadiene rubber.
 - 4. PTFE: Polytetrafluoroethylene plastic.
 - 5. SWP: Steam working pressure.
 - 6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its

application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
 - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- D. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

- E. Valve Actuators:
 - 1. Handwheel: For valves other than quarter-turn types.
 - 2. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
 - 3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- F. Extended Valve Stems: On insulated valves.
- G. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- H. Valve Grooved Ends: AWWA C606.
 - 1. Solder Joint: With sockets according to ASME B16.18.
 - a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
 - 2. Threaded: With threads according to ASME B1.20.1.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

- A. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- B. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.
- C. Type 2, Class 150, Bronze Angle Valves: Bronze body with PTFE or TFE disc and union-ring bonnet.
- D. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

2.3 CAST-IRON ANGLE VALVES

- A. Cast-Iron Angle Valves, General: MSS SP-85, Type II.
- B. Class 125, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.
- C. Class 250, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.

2.4 COPPER-ALLOY BALL VALVES

- A. Copper-Alloy Ball Valves, General: MSS SP-110.
- B. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum CWP rating.
- C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
- D. Three-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
- E. Safety-Exhaust, Copper-Alloy Ball Valves: Two-piece bronze body with exhaust vent opening, chrome-plated ball with vent, blowout-proof stem, locking handle, and working pressure rating for compressed air of at least 125 psig (860 kPa).

2.5 FERROUS-ALLOY BALL VALVES

- A. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.
- B. Ferrous-Alloy Ball Valves: Class 150, full port.

2.6 BRONZE CHECK VALVES

- A. Bronze Check Valves, General: MSS SP-80.
- B. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- C. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- D. Type 2, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- E. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- F. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
- G. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.7 GRAY-IRON SWING CHECK VALVES

- A. Gray-Iron Swing Check Valves, General: MSS SP-71.
- B. Type I, Class 125, gray-iron, swing check valves with metal seats.
- C. Type II, Class 125, gray-iron, swing check valves with composition to metal seats.
- D. 175-psig (1207-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.8 FERROUS-ALLOY WAFER CHECK VALVES

- A. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.
- B. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- C. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- D. Single-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.
- E. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- F. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- G. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

2.9 SPRING-LOADED, LIFT-DISC CHECK VALVES

- A. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.
- B. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.
- C. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.
- D. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- E. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.10 BRONZE GATE VALVES

- A. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- B. Type 1, Class 150, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.
- C. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.
- D. Type 3, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge and union-ring bonnet.

2.11 BRONZE GLOBE VALVES

- A. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- B. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- C. Type 2, Class 150, Bronze Globe Valves: Bronze body with nonmetallic disc and union-ring bonnet.
- D. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

- F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, or gate, gate, or plug valves.
 - 2. Throttling Service: Angle, ball, or globe valves.
 - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
 - 1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
 - 2. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 400-psig (2760-kPa) CWP rating, copper alloy.
 - 3. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal or vertical, bronze.
 - 4. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
 - 5. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
 - 6. Gate Valves, NPS 2 (DN 50) and Smaller: Type 1, Class 150, bronze.
 - 7. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
 - 8. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, lubricated-type with FDA-approved-material sealant, cast iron.
 - 9. Resilient-Seated, Eccentric Plug Valves, NPS 3 (DN 80) and Larger: 175-psig (1207-kPa) CWP rating, cast iron.
- D. Select valves, except wafer and flangeless types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water.
 - 2. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 - 3. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved. Do not use for steam or steam condensate piping.

3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.

- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

SECTION 15122

METERS AND GAGES

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 meters and gages for mechanical systems and water meters installed outside the building.
- B. Related Sections include the following:
 - 1. Division 2 Section "Water Distribution" for water meters outside the building.
 - 2. Division 2 Section "Natural Gas Distribution" for gas meters outside the building.
 - 3. Division 15 Section "Natural Gas Piping" for gas meters.
 - 4. Mechanical equipment Sections that specify meters and gages as part of factory-fabricated equipment.
- C. Utility-Furnished Products: Water meters will be furnished to site, ready for installation.

1.3 SUBMITTALS

- A. Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified.
- B. Shop Drawings: Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gage.
- C. Product Certificates: Signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and compliance with specified requirements.
- D. Maintenance Data: For meters and gages to include in maintenance manuals specified in Division 1. Include data for the following:
 - 1. Flow-measuring systems.
 - 2. Flowmeters.
 - 3. Thermal-energy flowmeters.
 - 4. Water meters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 THERMOMETERS, GENERAL

- A. Scale Range: Temperature ranges for services listed are as follows:
 - 1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions (0 to 115 deg C, with 1-degree scale divisions).
 - 2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (minus 18 to plus 38 deg C, with 1-degree scale divisions).
- B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 LIQUID-IN-GLASS THERMOMETERS

- A. Description: ASTM E 1.
- B. Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches (230 mm) long.
- C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- D. Tube: Red or blue reading, organic-liquid filled with magnifying lens.
- E. Tube: Red or blue reading, mercury filled with magnifying lens.
- F. Scale: Satin-faced nonreflective aluminum with permanently etched markings.
- G. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

2.4 DIRECT-MOUNTING, FILLED-SYSTEM DIAL THERMOMETERS

- A. Description: Vapor-actuated, universal-angle dial type.
- B. Case: Drawn steel or cast aluminum, with 4-1/2-inch- (115-mm-) diameter, glass lens.
- C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- D. Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.
- E. Movement: Brass, precision geared.

- F. Scale: Progressive, satin-faced nonreflective aluminum with permanently etched markings.
- G. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

2.5 BIMETAL DIAL THERMOMETERS

- A. Description: ASME B40.3; direct-mounting, universal-angle dial type.
- B. Case: Stainless steel with 5-inch- (125-mm-) diameter, glass lens.
- C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- D. Element: Bimetal coil.
- E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.
- F. Stem: Stainless steel for separable socket, of length to suit installation.

2.6 INSERTION DIAL THERMOMETERS

- A. Description: ASME B40.3, bimetal type.
- B. Dial: 1-inch (25-mm) diameter.
- C. Case: Stainless steel.
- D. Stem: Dustproof and leakproof 1/8-inch- (3-mm-) diameter, tapered-end stem with nominal length of 5 inches (125 mm).

2.7 SEPARABLE SOCKETS

- A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.
 - 1. Material: Brass, for use in copper piping.
 - 2. Material: Stainless steel, for use in steel piping.
 - 3. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.
 - 4. Insertion Length: To extend to center of pipe.
 - 5. Cap: Threaded, with chain permanently fastened to socket.
 - 6. Heat-Transfer Fluid: Oil or graphite.

2.8 THERMOMETER WELLS

- A. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.
 - 1. Material: Brass, for use in copper piping.
 - 2. Material: Stainless steel, for use in steel piping.
 - 3. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for wells for piping not insulated.
 - 4. Insertion Length: To extend to center of pipe.
 - 5. Cap: Threaded, with chain permanently fastened to socket.
 - 6. Heat-Transfer Fluid: Oil or graphite.

2.9 PRESSURE GAGES

- A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
- B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch- (115-mm-) diameter, glass lens.
- C. Connector: Brass, NPS 1/4 (DN8).
- D. Scale: White-coated aluminum with permanently etched markings.
- E. Accuracy: Grade B, plus or minus 2 percent of middle 50 percent of scale.
- F. Range: Comply with the following:
 - 1. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure (100 kPa of vacuum to 103 kPa of pressure).
 - 2. Fluids under Pressure: Two times the operating pressure.

2.10 PRESSURE-GAGE FITTINGS

- A. Valves: NPS 1/4 (DN8) brass or stainless-steel needle type.
- B. Syphons: NPS 1/4 (DN8) coil of brass tubing with threaded ends.
- C. Snubbers: ASME B40.5, NPS 1/4 (DN8) brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

2.11 TEST PLUGS

- A. Description: Nickel-plated, brass-body test plug in NPS 1/2 (DN15) fitting.
- B. Body: Length as required to extend beyond insulation.

- C. Pressure Rating: 500 psig (3450 kPa) minimum.
- D. Core Inserts: One or two self-sealing valves, suitable for inserting 1/8-inch (3-mm) OD probe from dial-type thermometer or pressure gage.
- E. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch (3-mm) OD probe from dial-type thermometer or pressure gage.
- F. Core Insert: Self-sealing valve, suitable for inserting 1/8-inch (3-mm) OD probe from dial-type thermometer or pressure gage.
- G. Core Material for Air, Water, Oil, and Gas: 20 to 200 deg F (Minus 7 to plus 93 deg C), chlorosulfonated polyethylene synthetic rubber.
- H. Core Material for Air and Water: Minus 30 to plus 275 deg F (Minus 35 to plus 136 deg C), ethylene-propylene-diene terpolymer rubber.
- I. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.
- J. Test Kit: Pressure gage and adapter with probe, two bimetal dial thermometers, and carrying case.
 - 1. Pressure Gage and Thermometer Ranges: Approximately two times the system's operating conditions.

2.12 WATER METERS

- A. Description: AWWA C700, displacement type, bronze case. Registers flow in gallons (liters) or cubic feet (cubic meters) as required by utility.

PART 3 - EXECUTION

3.1 METER AND GAGE INSTALLATION, GENERAL

- A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.

3.2 THERMOMETER INSTALLATION

- A. Install thermometers and adjust vertical and tilted positions.
- B. Install in the following locations:
 - 1. Inlet and outlet of each thermal storage tank.
 - 2. Outside-air, return-air, and mixed-air ducts.
 - 3. Each duct thermometer support flange.

- C. Install remote-reading dial thermometers in control panels with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.
- D. Install separable sockets in vertical position in piping tees where fixed thermometers are indicated.
 - 1. Install with socket extending a minimum of 2 inches (50 mm) into fluid.
 - 2. Install with socket extending to one-third of diameter of pipe.
 - 3. Install with socket extending to center of pipe.
 - 4. Fill sockets with oil or graphite and secure caps.
- E. Install thermometer wells in vertical position in piping tees where test thermometers are indicated.
 - 1. Install with stem extending a minimum of 2 inches (50 mm) into fluid.
 - 2. Install with stem extending to one-third of diameter of pipe.
 - 3. Install with stem extending to center of pipe.
 - 4. Fill wells with oil or graphite and secure caps.

3.3 PRESSURE-GAGE INSTALLATION

- A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
- B. Install dry-type pressure gages in the following locations:
 - 1. Building water-service entrance.
- C. Install liquid-filled-type pressure gages at suction and discharge of each pump.
- D. Install pressure-gage needle valve and snubber in piping to pressure gages.
 - 1. Exception: Install syphon instead of snubber in piping to steam pressure gages.

3.4 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to AWWA M6 and utility's requirements.
 - 1. Install displacement-type water meters with shutoff valve on water meter inlet. Install valve on water meter outlet and valved bypass around meter, unless prohibited by authorities having jurisdiction.

3.5 ROUGHING-IN FOR WATER METERS

- A. Install roughing-in piping and specialties for water meter installation according to utility's instructions and requirements.

3.6 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
 - 1. Install meters and gages adjacent to machines and equipment to allow service and maintenance.
 - 2. Connect flow-measuring-system elements to meters.
 - 3. Connect flowmeter transmitters to meters.
 - 4. Connect thermal-energy-flowmeter transmitters to meters.
- B. Make electrical connections to power supply and electrically operated meters and devices.
- C. Ground electrically operated meters.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- D. Install electrical connections for power and devices.
- E. Electrical power, wiring, and connections are specified in Division 16 Sections.

3.7 ADJUSTING AND CLEANING

- A. Calibrate meters according to manufacturer's written instructions, after installation.
- B. Adjust faces of meters and gages to proper angle for best visibility.
- C. Clean windows of meters and gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

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 domestic water piping from locations indicated to fixtures and equipment inside the building.
- B. Related Sections include the following:
 - 1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
 - 2. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.3 DEFINITIONS

- A. CPVC: Chlorinated polyvinyl chloride plastic.
- B. PA: Polyamide (nylon) plastic.
- C. PE: Polyethylene plastic.
- D. PP: Polypropylene plastic.
- E. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Service Piping: 160 psig (1100 kPa).
 - 2. Domestic Water Distribution Piping: 125 psig (860 kPa).

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.

- B. Water Samples: Specified in "Cleaning" Article in Part 3.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," and NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for combined fire-protection and domestic water service piping to building.
- C. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 DUCTILE-IRON PIPING

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint, bell- and plain-spigot end, unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron, standard pattern; or AWWA C153, ductile-iron, compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.3 COPPER TUBING

- A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
 - a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.4 CPVC PIPING

- A. CPVC Schedule 40 Pipe: ASTM F 441/F 441M.
1. CPVC Schedule 40 Fittings: ASTM F 438, socket type.

2.5 VALVES

- A. Refer to Division 15 Section "Plumbing Valves" for bronze and cast-iron, general-duty valves.
- B. Refer to Division 15 Section "Plumbing Specialties" for balancing and drain valves.
- C. CPVC Union Ball Valves: MSS SP-122, with full-port ball, socket detachable end connectors, and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).
1. Material Option: MSS SP-122, of plastic other than CPVC and suitable for potable water. Include threaded ends and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C), unless otherwise indicated.
- D. CPVC Check Valves: Swing or ball-check design and pressure rating not less than [150 psig (1035 kPa) at 73 deg F (23 deg C)] <Insert additional requirements>.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Grooved joints may be used on aboveground grooved-end piping.
- D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- E. Underground Domestic Water Service Piping: Use any of the following piping materials for each size range:
 - 1. NPS 2 (DN 50) and Smaller: Soft copper tube, Type K (Type A); copper pressure fittings; and soldered joints.
 - 2. NPS 2 (DN 50) and Smaller: CPVC, Schedule 40 pipe; CPVC, Schedule 40 socket fittings; and solvent-cemented joints.
- F. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:
 - 1. NPS 2 (DN 50) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
 - 2. NPS 2 (DN 50) and Smaller: ASTM F 441/F 441M, CPVC, Schedule [40] [80] pipe; CPVC, Schedule [40] [80] socket fittings; and solvent-cemented joints.
 - 3. NPS 2 (DN 50): Hard copper tube, Type L (Type B)] [Type M (Type C)]; copper pressure fittings; and soldered joints.
- G. Underground Domestic Water Piping NPS 4 (DN 100) and Smaller: Soft copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller.

3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

3.4 PIPING INSTALLATION

- A. Refer to Division 2 Section "Water Distribution" for site water distribution and service piping.
- B. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for basic piping installation.
- C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
- D. Install underground ductile-iron piping according to AWWA C600, and AWWA M41, and NFPA 24. Install buried piping inside building between wall and floor penetrations and connection to water service piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
 1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.
- E. Install underground copper tubing according to CDA's "Copper Tube Handbook."
- F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for sleeves and mechanical sleeve seals.
- G. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.
- H. Install aboveground domestic water piping level without pitch and plumb.
- I. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- J. Perform the following steps before operation:
 1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- K. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

- L. Check plumbing specialties and verify proper settings, adjustments, and operation.
- M. Energize pumps and verify proper operation.

3.5 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 ROUGHING-IN FOR WATER METERS

- A. Rough-in domestic water piping for water meter installation according to utility company's requirements. Water meters will be furnished by utility.

3.7 VALVE INSTALLATION

- A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
- B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
- C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
 - 2. Install stop-and-waste drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 (DN 50) and smaller. Refer to Division 15 Section "Plumbing Specialties" for balancing valves.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
 2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
 3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
- F. Install supports for vertical steel piping every 15 feet (4.5 m).
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
- H. Install supports for vertical copper tubing every 10 feet (3 m).
- I. Install hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 (DN 25) and Smaller: 36 inches (900 mm) with 3/8-inch (10-mm) rod.
 2. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
- J. Install supports for vertical CPVC piping every 60 inches (1500 mm) for NPS 1 (DN 25) and smaller and every 72 inches (1800 mm) for NPS 1-1/4 (DN 32) and larger.
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
 - 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
 - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.10 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.11 ADJUSTING

- A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 2. Adjust calibrated balancing valves to flows indicated.

3.12 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

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 soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.
- B. Related Sections include the following:
 - 1. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.
 - 2. Division 15 Section "Sewage Pumps" for drainage connections for effluent pumps.

1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber piping materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. EPDM: Ethylene-propylene-diene terpolymer.
 - 3. NBR: Acrylonitrile-butadiene rubber.
 - 4. PE: Polyethylene plastic.
 - 5. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 CAST-IRON SOIL PIPING

- A. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
 - a. Heavy-Duty, FM-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4 (DN 40 to DN 100): 3-inch- (76-mm-) wide housing with 2 bands.

2.3 COPPER TUBING

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

2.4 PVC PIPING

- A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

- B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
 - 1. Solvent Fittings: NPS 3 to NPS 8 (DN 80 to DN 200).
 - 2. NPS 1-1/4 and NPS 4 (DN 32 and DN 100): Use NPS 1-1/2 (DN 40) hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type 301, stainless steel.
 - b. Couplings: Heavy-duty, FM approved.
 - 3. NPS 1-1/4 and NPS 4 (DN 32 and DN 100): Copper DWV tube, copper drainage fittings, and soldered joints.
- D. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - 1. NPS 1-1/2 to NPS 4 (DN 40 to DN 100): PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

- A. Refer to Division 2 Section "Sanitary Sewerage" for Project-site sanitary sewer piping.
- B. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for basic piping installation.
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- I. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Cast-Iron, Solvent, Single Stack: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- L. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for basic piping joint construction.

- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- D. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
 3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
 4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
- H. Install supports for vertical copper tubing every 10 feet (3 m).
- I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
- J. Install supports for vertical PVC piping every 48 inches (1200 mm).
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS**A. Minimum Operating-Pressure Ratings:**

1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa), and is reduced to secondary pressure of 0.5 psig (3.45 kPa) or less.**C. Delegated Design:** Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.**1.3 SUBMITTALS****A. Product Data:** For each type of product indicated.**B. Shop Drawings:** For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.**C. Delegated-Design Submittal:** For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

D. Welding certificates.

- E. Field quality-control reports.
- F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. PE Pipe: ASTM D 2513, SDR 11.
 - 1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
 - 2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
 - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering.
 - c. Aboveground Portion: PE transition fitting.
 - d. Outlet shall be threaded or suitable for welded connection.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm).

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller.
3. Strainer Screen: [40] -mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig (862 kPa).
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
 - 6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
- C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
 - 1. Body: Bronze, complying with ASTM B 584.
 - 2. Ball: Chrome-plated brass.
 - 3. Stem: Bronze; blowout proof.
 - 4. Seats: Reinforced TFE; blowout proof.
 - 5. Packing: Separate packnut with adjustable-stem packing threaded ends.
 - 6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 7. CWP Rating: 600 psig (4140 kPa).
 - 8. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Body: Bronze, complying with ASTM B 584.
 - 2. Ball: Chrome-plated bronze.
 - 3. Stem: Bronze; blowout proof.
 - 4. Seats: Reinforced TFE; blowout proof.
 - 5. Packing: Threaded-body packnut design with adjustable-stem packing.

6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: 600 psig (4140 kPa).
8. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B 584.
2. Plug: Bronze.
3. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig (862 kPa).
6. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. PE Ball Valves: Comply with ASME B16.40.

1. Body: PE.
2. Ball: PE.
3. Stem: Acetal.
4. Seats and Seals: Nitrile.
5. Ends: Plain or fusible to match piping.
6. CWP Rating: 80 psig (552 kPa).
7. Operating Temperature: Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C).
8. Operator: Nut or flat head for key operation.
9. Include plastic valve extension.
10. Include tamperproof locking feature for valves where indicated on Drawings.

G. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Pilot operated.
2. Body: Brass or aluminum.

3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
6. NEMA ICS 6, Type 4, coil enclosure.
7. Normally closed.
8. Visual position indicator.

2.6 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
2. Maximum Operating Pressure: 5 psig (34.5 kPa).
3. Cast-aluminum body with nickel-plated chrome steel internal parts.
4. Nitrile-rubber valve washer.
5. Sight windows for visual indication of valve position.
6. Threaded end connections complying with ASME B1.20.1.
7. Wall mounting bracket with bubble level indicator.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
5. Orifice: Aluminum; interchangeable.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
9. Overpressure Protection Device: Factory mounted on pressure regulator.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: 2 psig (13.8 kPa).

2.8 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Description:

- a. Standard: ASSE 1079.
- b. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.9 LABELING AND IDENTIFYING

- ### A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- #### A. Comply with NFPA 54 & the International Fuel Gas Code for installation and purging of natural-gas piping.
- #### B. Install underground, natural-gas piping buried at least 36 inches (900 mm) below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.
1. If natural-gas piping is installed less than 36 inches (900 mm) below finish grade, install it in containment conduit.
- #### C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- #### D. Steel Piping with Protective Coating:
1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 3. Replace pipe having damaged PE coating with new pipe.
- #### E. Install fittings for changes in direction and branch connections.
- #### F. Install pressure gage port downstream from each service regulator.

3.2 INDOOR PIPING INSTALLATION

- #### A. Comply with NFPA 54 & the International Fuel Gas Code for installation and purging of natural-gas piping.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.

- R. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.3 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.

5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 2. Bevel plain ends of steel pipe.
 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- F. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- B. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
 2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
- D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
 2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
 3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.6 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be one of the following:
 - 1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
 - 2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- B. Aboveground natural-gas piping shall be **one of** the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.

- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

- A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.
- B. Underground: PE or Bronze plug valves.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be **one of** the following:
 - 1. One-piece, bronze ball valve with bronze trim.
 - 2. Two-piece, full-port, bronze ball valves with bronze trim.
 - 3. Bronze plug valve.
- B. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.
 - 2. Two-piece, full-port, bronze ball valves with bronze trim.
 - 3. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.
 - 2. Two-piece, full-port, bronze ball valves with bronze trim.
 - 3. Bronze plug valve.

END OF SECTION

SECTION 15375 SPRINKLER AND STANDPIPE SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED:

- A. Hydraulically designed sprinkler systems, for complete protection throughout the building, ready for operation, including all necessary accessories and equipment. Dry sprinkler protection shall be provided where indicated on the drawings.
- B. Replace standard response sprinklers in renovated areas with quick response sprinklers.
- C. Relocate other sprinklers in renovated areas as required.

1.2 RELATED WORK AND APPLICABLE REQUIREMENTS SPECIFIED ELSEWHERE:

- A. Division 0 and 1 - CONTRACT REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to all work in this Section.
- B. Related Work:
 - 1. Division 9 - FINISHES.
 - 2. Section 15010 - BASIC PLUMBING REQUIREMENTS.
 - 3. Section 15072 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT.
 - 4. Division 16 - ELECTRICAL.

1.3 REFERENCE STANDARDS:

- A. All work shall comply with the requirements of the following:
 - 1. National Fire Code (NFPA) Edition 13 and 14, latest applicable.
 - 2. International Building Code.
 - 3. American National Standards Institute Publications (ANSI).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. National Electrical Code.
 - 6. Factory Mutual (FM).
 - 7. Standards and periodical listings, Underwriters Laboratories, Inc. (UL).

1.4 QUALITY ASSURANCE:

- A. Design and install automatic sprinkler systems in accordance with NFPA 13.
- B. Hydraulic calculations shall be based on the following criteria:

SPACE	SPRINKLER PROTECTION			
	Light	Ord. Gp. 1	Ord. Gp. 2	Ext. Haz.
General living areas and offices	X			
Storage rooms, trash hopper, linen rooms		X		
Mechanical equipment rooms and Electrical equipment rooms.		X		
Apparatus Bay			X	
Laundry Rooms			X	
Hose Stream Allowance (GPM)	100	250	250	500

- C. The hydraulic calculations shall use no more than 90 percent of the available pressure at the connection to the standpipe and/or sprinkler riser.
- D. Piping installed in finished areas shall be concealed.

1.5 QUALIFICATIONS OF INSTALLER:

- A. Prior to installation, submit data for approval showing that the contractor has successfully installed automatic sprinkler systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.

1.6 GENERAL REQUIREMENTS:

- A. Section 15010, BASIC PLUMBING REQUIREMENTS, applies to this section, with the additions and modifications specified herein.

1.7 DESCRIPTION OF WORK:

- A. The work includes designing and installing hydraulically calculated automatic sprinkler systems as required to afford complete (100%) fire protection coverage through-out new building. The design, equipment, materials, installation, workmanship, examination, inspection, and testing shall be in accordance with the required and advisory provisions of NFPA 13. Each system shall include all materials, accessories, and equipment inside and outside the building to provide complete systems ready for

use. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers, smoke detectors, exit signs, speakers, and other ceiling elements. Refer to detail on drawings for centering sprinkler heads. Devices and equipment for fire protection service shall be UL listed or FM approved for use in automatic sprinkler systems. In the NFPA publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the work "shall" has been substituted for "should" wherever it appears.

1.8 SUBMITTALS:

- A. Refer to Section 15010 – Basic Plumbing Requirements.
- B. Prior to submitting sprinkler drawings to the Architect/Engineer, obtain approval from the, the local Fire Department, and the Owner's fire insurance underwriter. Submit proof of approval to the architect/engineer. Each document in the submittals shall be stamped by each of the aforementioned parties.
- C. Partial submittals will not be acceptable. Submittal data shall show the specific model, type, and size of each item the Contractor proposes to provide.
- D. Submittals shall include but not be limited to manufacturer's data for the following:
 - 1. Pipe, fittings, and mechanical couplings
 - 2. Alarm valves
 - 3. Valves
 - 4. Water motor alarms
 - 5. Sprinkler heads with color standards for concealed heads
 - 6. Pipe hangers and supports
 - 7. Pressure switch
 - 8. Fire department connection (Siamese and roof outlet)
 - 9. Tamper switches
 - 10. Flow switch
 - 11. Inspector's test assembly including sight glass, valve, and orifice union.
- E. Submit complete "Working Drawings (Plans)" and hydraulic calculations as one package.

1.9 AS-BUILT (RECORD) WORKING DRAWINGS:

- A. Refer to Section 15010 – Basic Plumbing Requirements.

1.10 ELECTRICAL WORK:

- A. Electrical work shall be by Division 16.

1.11 SEISMIC REQUIREMENTS

- A. Refer to Section 15072 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 2 PRODUCTS

2.1 PIPING:

A. Interior:

1. Pipe:
 - a. Black steel, Schedule 40, ASTM A53, A120 or A135; Schedule 10, ASTM A135.
 - b. Copper Tube: ASTM B88, seamless drawn.
 - c. CPVC Pipe: Victaulic Firelock, ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), with plain ends. Include "Listed" and "CPVC Sprinkler Pipe" markings.
 - d.
2. Joints:
 - a. Schedule 40, Black steel, pipe: Screwed joints, ANSI B2.1, welded joints, AWS D10.9, mechanical grooved couplings or push-on couplings, joined by a UL and FM approved combination of bolted couplings, gaskets and grooves. Grooves may be rolled or cut and be dimensionally compatible with the coupling.
 - b. Schedule 10, Black steel pipe: Welded joints, AWS D10.9, and by UL and FM approved mechanical couplings. Couplings may be of the bolted rolled grooved type. Grooves for the rolled grooved type shall be rolled only.
 - c. Copper Pipe: Joints shall be brazed for Ordinary Group 2 and Extra Hazard Occupancies and may be brazed for Light and Ordinary Group 1 Occupancies where piping is concealed. Where mechanical formed tee connections are provided, only brazed joints shall be used. Brazing alloys shall conform to AWS A5.8 Classifications BCuP-3, BCuP-4, or BCuP-5. Soldering shall be performed using non-corrosive flux.
3. Fittings:
 - a. Cast iron screwed: ANSI B16.5.
 - b. C.I. flanged: ANSI B16.1.
 - c. Malleable iron screwed: ANSI B16.3.
 - d. Steel weld fitting: ANSI B16.5, ANSI B16.9, ANSI B16.11, ANSI B16.25, and ASTM A234.
 - e. Grooved couplings and mechanical fitting; UL and FM listed, malleable iron, 500 psi working pressure; ASTM A47. Coupling gaskets shall be butyl rubber or EPDM Compound. Mechanical locking type couplings, maximum 175 psi WWP.

- f. Wrought copper bronze. Solder-joint pressure fitting, ANSI B16.22.
 - g. Mechanically formed tee connection: Form mechanically extracted collars in a continuous operation by drilling pilot hole and drawing out tube surface to form collar, having a height of not less than three times the thickness of tube wall. Adjustable collaring device shall insure proper tolerance and complete uniformity of the joint. Notch and dimple joining branch tube in a single process to provide free flow where the branch tube penetrates the fitting. Braze joints.
 - h. Adjustable drop nipple: Black steel, 2-1/2 to 5 inches, consisting of body, nipple, retaining ring, O-ring and rollers. UL and FM approved, 175 psig WWP.
 - i. Hooking collar assembly: May be optionally used to connect sprinkler or drop nipples to sprinkler pipe. Housing shall be malleable iron or ductile iron. UL and FM approved, 175 psi WWP.
 - j. Changes in pipe size shall be accomplished using concentric reducing fittings; bushings will not be permitted.
 - k. CPVC Fittings: Schedule 80, Victaulic Firelock.UL-listed, for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), socket type. Include "Listed" and "CPVC Sprinkler Fitting" markings.
4. Sections of branch lines, cross mains, feed mains or risers may be welded subject to limitations as outlined in NFPA-13.
- B. Exterior: From inside face of exterior wall to a distance of approximately five feet outside of building and underground inside building, material shall be ductile iron, AWWA C151, working pressure 150 psig, with exterior bituminous coating and cement lined. Provide flanged and anchored connection to interior piping.
- 2.2 PIPE HANGERS AND SUPPORTS:
- A. Hangers shall be clevis type hangers on all pipe 4" and larger.
 - B. Provide all others in accordance with NFPA 13.
- 2.3 SPARE SPRINKLER HEAD CABINET:
- A. Provide metal cabinet with extra sprinkler heads and sprinkler head wrench at locations indicated on drawings. The number and types of extra sprinkler heads shall be as specified in NFPA 13.
- 2.4 PRESSURE SWITCH:
- A. Provide switch with circuit opener and closer for the automatic transmittal of an alarm over the facility fire alarm system. Connect into the building fire alarm system. Alarm actuating device shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.

2.5 ELECTRIC ALARM GONG:

- A. Provide an exterior electrically operated gong at the location indicated on the drawings. Electrical characteristics of the gong shall be compatible with the fire alarm system, coordinate with Division 16 prior to purchasing.

2.6 VALVES (INTERIOR):

- A. Provide valves of types approved for fire service. Gate valves shall open by counterclockwise rotation. Provide a rising stem, OS&Y valve at the base of each standpipe.
- B. Check valves shall be flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 4 inches and larger.

2.7 IDENTIFICATION SIGNS:

- A. Attach properly lettered and approved metal signs to each valve and alarm device. [Permanently affix hydraulic design data nameplates to the riser of each system.]

2.8 INSPECTOR'S TEST CONNECTION:

- A. Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate as shown on drawings.

2.9 MAIN DRAINS:

- A. Provide drain piping to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. Provide auxiliary drains as required by NFPA 13.

2.10 FIRE PROTECTION EQUIPMENT

- A. Acceptable Manufacturers - Fire Protection Equipment

- 1. Potter-Roemer, Inc.
- 2. Croker-Standard Division/Fire-End and Croker Corporation.
- 3. Larsen's Manufacturing Company.

- B. Fire Department Valve

- 1. Potter-Roemer number 4065-B, 2-1/2 inch polished brass fire department angle hose valve.
- 2. One (1) Potter-Roemer number 2810-B, polished brass 1-2 inch by 1-1/2 inch screw-on reducer.
- 3. One (1) Potter-Roemer number 4615-B polished brass 1-2 inch cap and chain.
- 4. Furnish and install brass flow restricting disc if required by local Fire Marshal.

2.11 PIPE SLEEVES:

- A. Provide where piping passes through walls, floors, roofs, and partitions. Grout sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide clearance between exterior of piping and interior of sleeve in accordance with NFPA 13. Firmly pack space with noncombustible insulation. Caulk both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.
- B. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel sheet having a nominal weight of not less than 0.90 psf.

2.12 ESCUTCHEON PLATES:

- A. Provide one piece or split hinge type metal plates for piping passing through floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on plates in unfinished spaces. Secure plates in proper position.

2.13 VALVES (EXTERIOR):

- A. Provide as required by NFPA 24. Gate valves shall conform to AWWA C500 or UL 262 with cast-iron body and bronze trim and shall open by counterclockwise rotation.

2.14 VALVE BOXES:

- A. Except where indicator posts are provided, for each buried valve, provide cast-iron or ductile-iron valve box of a suitable size. Provide cast-iron or ductile-iron cover for valve box with the word WATER cast on the cover. The minimum box shaft diameter shall be 5.25 inches. Coat cast-iron and ductile-iron boxes with bituminous paint applied to a minimum dry-film thickness of 10 mils.

2.15 BURIED UTILITY WARNING AND IDENTIFICATION TAPE:

- A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED WATER PIPING BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

2.16 AUTOMATIC BALL DRIPS:

- A. Underwriters Laboratories, Inc., or Factory Mutual Research Corporation approved, 3/4-inch brass in-line automatic ball drip with both ends threaded with iron pipe threads. Pipe drain to spill over floor drain, over mop sink, or as approved.

2.17 SPRINKLERS:

- A. Contractor shall provide Underwriters Laboratories Inc., UL listed, automatic sprinkler heads, having temperature ratings suitable for the locations (per NFPA-13). Provide the following type of sprinkler heads:

TYPE	LOCATION
Recessed (not concealed), Glass Bulb, Pendant, Reliable Automatic Sprinkler Co., Inc Model F1FR	Aesthetically sensitive areas with ceilings
Upright or Pendant, Brass, Glass Bulb, Reliable Automatic Sprinkler Co., Inc Model F1FR	Unfinished areas, areas without ceilings

- B. Automatic sprinkler heads other than those listed above may be used subject to approval by Architect/Engineer and provided they are used in accordance with their listing.
- C. Color of concealed heads shall be manufacturer's standard white to match ceilings. Color sample must be submitted. See 1.8 SUBMITTALS Paragraph c.

PART 3 EXECUTION

3.1 INSPECTION OF SITE:

- A. Prior to submitting bid, visit the site of the proposed construction and thoroughly investigate existing utilities, working conditions to be encountered etc. No additional compensation shall be allowed for conditions increasing cost which were not known when submitting proposal if the condition was obvious and could have been discovered during a site visit.

3.2 DESIGN OF SPRINKLER SYSTEMS:

- A. NFPA 13 and requirements specified herein. Design of automatic sprinkler systems shall be by hydraulic calculation.

- B. Water Supply: Base hydraulic calculations on a recent flow test. Flow test shall be conducted in accordance with NFPA 13, arranged and paid for by the Contractor and witnessed by the Engineer. Contractor shall notify Engineer a minimum of 72 hours in advance of test. Flow test shall be no more than 180 days old at the date of submittal.
- C. Excess Pressure Pump: Provide pumps on each sprinkler piping riser. Pumps shall be of the positive displacement, gear type rated at 1 gallon per minute, integrally mounted with motor. Pump and motor unit shall be approved for automatic wet pipe fire extinguishing sprinkler systems and shall be complete with pilot light panel, differential motor control switch, high pressure switch, and low pressure switch. Make electrical power supply connections for pump and pilot light panel at the supply side of building service panel; provide a separate fused safety-type switch with locked lever for each connection.

3.3 INSTALLATION:

- A. Equipment, materials, installation, workmanship, examination, inspection, and testing shall be in accordance with NFPA 13 and 14, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position.
- B. Perform welding in the shop, field welding will not be permitted.
- C. Supervisory Switches: For each standpipe riser control valve the main entrance service valve, valves on the supply and discharge of the fire pump, and bypass valves. Install a supervisory switch coordinated with the fire alarm system. Switches are furnished and installed under this contractor, wiring by Division 16.
- D. Provide pressure gauges at each discharge pipe from fire pump, pressure tank if required, and at top of each standpipe riser, and as shown on drawings.

3.4 DISINFECTION:

- A. Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C601. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with clean water until maximum residual chlorine content is not greater than 0.2 parts per million. Exercise caution when mixing chlorine disinfection solutions.

3.5 FIELD PAINTING:

- A. Systems in exposed, finished areas: lean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat of Mil. Spec. DOD-P-15328 pretreatment primer applied to a minimum dry fill thickness of 0.3 mil, and one coat of Fed. Spec. TT-P-645 primer applied to a minimum dry film thickness of 1.0 mil. Shield sprinkler heads with protective covering while painting is in process. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:
- B. Systems in Unfinished Areas: Unfinished areas are defined as attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, and spaces where walls or ceiling are not painted or not constructed of a prefinished material. Provide primed surfaces with one coat of Fed. Spec. TT-E-489 red enamel applied to a minimum dry film thickness of 1.0 mil. In lieu of field painting, Contractor may provide piping with 2-inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20-foot intervals.
- C. Systems in Other Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of Fed. Spec. TT-E-489 red enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2-inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20-foot intervals. In finished areas such as offices, the red bands may be omitted

3.6 FIELD TESTING AND FLUSHING:

- A. Preliminary Tests: Hydrostatically test each system at 200 psig for a 2-hour period with no leakage or reduction in gauge pressure. Flush piping with potable water in accordance with NFPA 13. Piping above suspended ceilings shall be inspected, tested, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests are completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for formal inspection and tests. Conduct this test in presence of authorized representative.

END OF SECTION

SECTION 15380 - ELECTRIC-DRIVE, VERTICAL-TURBINE FIRE PUMPS

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 electric-drive, vertical-turbine fire pumps and the following:
 - 1. Full-service fire-pump controllers and automatic transfer switches.
 - 2. Fire-pump accessories and specialties.
 - 3. Pressure-maintenance pumps, controllers, accessories, and specialties.
 - 4. Alarm panels.
 - 5. Flowmeter systems.

1.3 PERFORMANCE REQUIREMENTS

- A. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: 175-psig (1200-kPa) minimum working-pressure rating, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, certified pump performance curves with each selection point indicated, operating characteristics, and furnished accessories and specialties for each fire pump and pressure-maintenance pump.
- B. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, pressure-maintenance pumps, pressure-maintenance-pump controllers, and pressure-maintenance-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that fire pumps and drivers and fire-pump controllers, pressure-maintenance pumps, accessories, and specialties will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Certificates: For each type of fire pump and fire-pump controller, signed by product manufacturer.
- E. Source quality-control test reports.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For fire pumps and drivers, pressure-maintenance pumps, controllers, accessories and specialties, alarm panels, and flowmeter systems to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of fire pumps, pressure-maintenance pumps, and controllers and are based on specific systems indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation.
- E. Comply with NFPA 20, "Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 VERTICAL-TURBINE FIRE PUMPS

- A. Description: UL 448, factory-assembled and -tested, electric-drive, vertical-turbine fire pumps capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 140 percent of total rated head.
1. Manufacturers:
 - a. Armstrong
 - b. A-C Pump; ITT Industries.
 - c. Aurora Pump; Pentair Pump Group.
 - d. Patterson Pump Company.
 - e. Sterling Peerless Pump; Sterling Fluid Systems Group.
 2. Fabricate base and attachment to fire pumps, pressure-maintenance pumps, and controllers with reinforcement to resist movement of pumps and controllers during a seismic event when their bases are anchored to building structure.
 3. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 4. Nameplate: Complete with capacities, characteristics, and other pertinent data.
 5. Pump: Vertical-turbine-type with impellers discharging into bowls and vertical pump column.
 6. Construction:
 - a. Pump Head: Cast iron, for aboveground discharge, with discharge flange machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
 - b. Line Shaft: Stainless steel or steel with corrosion-resistant shaft sleeves.
 - c. Pump Line Shaft Bearings: Rubber sleeve, water lubricated.
 - d. Line Shaft: Steel.
 - e. Pump Line Shaft Bearings: Corrosion resistant, oil lubricated.
 - f. Impeller Shaft: Monel metal or stainless steel.
 - g. Pump Bowl Assemblies: Cast iron with closed-type bronze impellers.
 - h. Pump Column: Steel pipe in sections 10 feet (3 m) or less and of length indicated.
 - i. Suction Strainer: Cast or fabricated, bronze or stainless steel with free area not less than 4 times suction inlet cross-sectional area, with openings that will not permit passage of a 5/16-inch (7.9-mm) sphere for pump rating

of 500 gpm (1892 L/minute) or less, or 1/2-inch (12.7-mm) sphere for pump rating of more than 500 gpm (1892 L/minute).

7. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.

- a. Available Manufacturers:

- 1) Emerson; U.S. Electrical Motors.
- 2) Lincoln Electric Company (The).
- 3) Marathon Electric, Inc.

B. Fire-Pump Characteristics and Specialty Data:

1. Fire-Pump Plan No.: FFP-1.
 - a. Rated Capacity: 400 GPM.
 - b. Total Rated Head: 65 psi.
 - c. Discharge Flange Size: 5 inches.
 - d. Discharge Flange Class: 125.
 - e. Speed: Same as driver.
2. Electric-Motor Driver: 30 hp, 3600 rpm, 3 phase, 60 Hz.
 - a. Full-Load Amperes: 428.2 A.
 - b. Minimum Circuit Ampacity: 18.9 A.
 - c. Short Circuit Amperes: 500 A.
3. Test Header Size: 4 inches.
 - a. Hose Valves Required: Two.
 - b. Hose Valve Size: NPS 2-1/2 (DN 65).

2.3 FIRE-PUMP CONTROLLERS

- A. Fire-Pump Controllers, General: UL 218 and NFPA 20; listed for electric-drive, fire-pump service and service entrance; combined automatic and manual operation; factory assembled and wired; and factory tested for capacities and electrical characteristics.

1. Manufacturers:
 - a. Cutler-Hammer.
 - b. Firetrol, Inc.
 - c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.
 - g. Tornatech

2. Rate controllers for scheduled fire-pump horsepower and short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.
3. Enclosure: UL 50, Type 2, dripproof, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
4. Controls, devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used, and specific items listed.
 - a. Isolating means and circuit breaker.
 - b. "Power on" pilot lamp.
 - c. Fire-alarm system connections for indicating motor running condition, loss-of-line power, and line-power phase reversal.
 - d. Automatic and manual operation, and minimum run-time relay to prevent short cycling.
 - e. Water-pressure-actuated switch with independent high and low calibrated adjustments responsive to water pressure in fire-suppression piping.
 - f. Automatic and manual shutdown.
 - g. System pressure recorder, electric ac driven with spring backup.
5. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.
6. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, NPS 1/2 (DN 15), with globe valves for testing controller mechanism from system to pump controller as indicated. Include bronze check valve with 3/32-inch (2.4-mm) orifice in clapper or ground-face union with noncorrosive diaphragm having 3/32-inch (2.4-mm) orifice.

B. Full-Service Fire-Pump Controllers:

1. Type Starting: Autotransformer, closed transition.
2. Mounting: Floor-stand type for field electrical connections.
3. Automatic Transfer Switches: UL 218 and UL 1008 and requirements for and attached to fire-pump controllers. Include enclosure complying with UL 50, Type 2, with automatic transfer switch with rating at least equal to fire-pump driver-motor horsepower. Include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Include the following:
1. Automatic air-release valve.
 2. Circulation relief valve.
 3. Discharge pressure gages.
 4. Concentric-tapered reducer at discharge outlet.
 5. Test-Header Manifold: Ductile-iron or brass body for hose valves. Include nozzle outlets arranged in single line; horizontal, flush-wall mounting attachment;

- and rectangular, polished chrome-plated brass finish escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
6. Test-Header Manifold: Ferrous body for hose valves. Manufacturer's standard finish. Include bronze or cast-iron, exposed-type valve header with nozzle outlets; and round, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
 7. Hose Valves: UL 668, straightway pattern, and bronze with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards and finish same as for test-header-manifold escutcheon plate.
 8. Ball Drip Valve: UL 1726.
 9. Main Relief Valve: UL 1478, spring loaded.
 10. Discharge Cone: Closed type.
 11. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.

2.5 PRESSURE-MAINTENANCE PUMPS

- A. Pressure-Maintenance Pumps, General: Factory-assembled and -tested pumps with electric-motor driver, controller, and accessories and specialties. Include cast-iron or stainless-steel casing and bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 125 dimensions unless Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.
 1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacity, characteristics, and other pertinent data.
- B. Multistage, Pressure-Maintenance Pumps: Multiple-impeller type complying with HI 1.1-1.2 and HI 1.3 requirements for multistage centrifugal pumps. Include base.
 1. Manufacturers:
 - a. A-C Pump; ITT Industries.
 - b. Armstrong Pumps
 - c. Grundfos Pumps Corp.
 - d. Paco Pumps, Inc.
 - e. Sterling Peerless Pump; Sterling Fluid Systems Group.
 - f. Taco, Inc.
 2. Driver: NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
- C. Controllers: UL 508; factory-assembled, -wired, and -tested, across-the-line type for combined automatic and manual operation.
 1. Manufacturers:
 - a. Cutler-Hammer.
 - b. Firetrol, Inc.

- c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.
 - g. Tornatech
- 2. Enclosure: UL 508 and NEMA 250, Type 2, wall-mounting type for field electrical wiring.
 - a. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
- 3. Rate controller for scheduled horsepower and include the following:
 - a. Fusible disconnect switch.
 - b. Pressure switch.
 - c. Hand-off-auto selector switch.
 - d. Pilot light.
 - e. Running period timer.
- D. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:
 - 1. Circulation relief valve.
 - 2. Gages: Suction and discharge pressure gages.
- E. Pressure-Maintenance-Pump Characteristics and Specialty Data:
 - 1. Plan No.: JP-1.
 - 2. Rated Capacity: 5 gpm.
 - 3. Total Rated Head: 175 ft.
 - 4. Pump Speed: 3500 rpm.
 - 5. Electric-Motor Driver Size: 0.75 hp, 3500 rpm, 3 phase, 60 Hz.
 - a. Full-Load Amperes: 3.5 A.
 - b. Short Circuit Amperes: 20 A.

2.6 ALARM PANELS

- A. Description: Factory-assembled and -wired remote panel complying with UL 508 and requirements in NFPA 20. Include audible and visible alarms matching controller type.
 - 1. Manufacturers:
 - a. Cutler-Hammer.
 - b. Firetrol, Inc.
 - c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.

2. Enclosure: NEMA 250, Type 2, remote wall-mounting type.
 - a. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
3. Features: Include manufacturer's standard features and the following:
 - a. Motor-operating condition.
 - b. Loss-of-line power.
 - c. Phase reversal.
 - d. Low-water alarm.

2.7 FLOWMETER SYSTEMS

- A. Description: Fire-pump flowmeter system that indicates flow to not less than 175 percent of fire-pump rated capacity. Include sensor of size to match pipe, tubing, flowmeter, and fittings.
 1. FMG-Approved Manufacturers:
 - a. Dieterich Standard Inc.
 - b. Gerand Engineering Co.
 - c. Hyspan Precision Products, Inc.
 - d. Meriam Instruments Div.; Scott Fetzer Co.
 - e. Preso Meters Corporation.
 - f. Reddy-Buffaloes Pump Co.
 2. Pressure Rating: 175-psig (1200-kPa) minimum.
 3. Sensor: Venturi, annubar probe, or orifice plate, unless otherwise indicated.
 4. Flowmeter: Compatible with flow sensor with dial not less than 4-1/2 inches (115 mm) in diameter or manufacturer's equivalent size.
 5. Permanently Mounted Flowmeter: Suitable for wall mounting with copper tubing to connect to flow sensor.

2.8 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dial with range of 0- to 250-psig (0- to 1725-kPa) minimum. Include caption "WATER" on dial face.
 1. Manufacturers:
 - a. AGF Manufacturing Co.
 - b. AMETEK, Inc.; U.S. Gauge.
 - c. Brecco Corporation.
 - d. Dresser Equipment Group; Instruments Div.
 - e. Marsh Bellofram.
 - f. WIKA Instrument Corporation.

2.9 GROUT

- A. Description: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

2.10 SOURCE QUALITY CONTROL

- A. Test and inspect fire pumps with their controllers according to NFPA 20 for certified shop tests.
- B. Verification of Performance: Rate fire pumps according to requirements indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, concrete bases, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

- A. Install concrete bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.3 INSTALLATION

- A. Install and align fire pump, pressure-maintenance pump, and controller according to NFPA 20.
- B. Install pumps and controllers to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Set pumps on concrete bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
 - 1. Support pump baseplate on rectangular metal blocks and shims or on metal wedges having small taper, at points near anchor bolts, to provide 3/4- to 1-1/2-inch (19- to 38-mm) gap between pump base and concrete base for grouting.
 - 2. Adjust metal supports or wedges until pump and driver shafts are aligned. Verify that coupling faces and pump suction and discharge flanges are level and plumb.
- D. Install discharge piping equal to or greater than diameter of fire-pump nozzles.
- E. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.
- F. Install pressure gage on fire-pump discharges at pressure-gage tapping.
- G. Support pumps and piping separately so weight of piping does not rest on pumps.
- H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports.
- I. Install flowmeters and sensors where indicated. Install flowmeter-system components and make connections according to manufacturer's written instructions.
- J. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 ALIGNMENT

- A. Align fire-pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment according to HI 2.4 and to tolerances specified by manufacturer.

3.5 CONNECTIONS

- A. Piping installation requirements are specified in Division 13 Section "Fire-Suppression Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect water supply and discharge piping to fire pumps and pressure-maintenance pumps with flexible connectors. Refer to Division 13 Section "Fire-Suppression Piping" for flexible connectors.
- D. Connect relief-valve discharge to point of disposal.
- E. Connect flowmeter-system sensors and meters according to manufacturer's written instructions.
- F. Connect controllers to pumps.
- G. Connect fire-pump controllers to building fire-alarm system. Refer to Division 13 Section "Fire Alarm."
- H. Ground equipment according to Division 16 Section "Grounding and Bonding."
- I. Connect wiring according to Division 16 Section "Conductors and Cables."

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform field tests for each fire pump when installation is complete. Comply with operating instructions and procedures in NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Final Checks before Startup: Perform the following preventive-maintenance operations and checks:
 - a. Lubricate oil-lubrication-type bearings.
 - b. Remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
 - c. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

- d. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.
- 3. Starting procedure for pumps is as follows:
 - a. Prime pump by opening suction valve and closing drains, and prepare pump for operation.
 - b. Open sealing-liquid supply valves if pump is so fitted.
 - c. Start motor.
 - d. Open discharge valve slowly.
 - e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately but let packing run in before reducing leakage through stuffing boxes.
 - f. Check general mechanical operation of pump and motor.
- 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- 5. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of Owner.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps, drivers, controllers, and pressure-maintenance pumps. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15380

SECTION 15410

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes plumbing fixtures and related components.
- B. Related Sections include the following:
 - 1. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 2. Plastic Lavatories: ANSI Z124.3.
 3. Plastic Mop-Service Basins: ANSI Z124.6.
 4. Plastic Shower Enclosures: ANSI Z124.2.
 5. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 6. Slip-Resistant Bathing Surfaces: ASTM F 462.
 7. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M.
 8. Vitreous-China Fixtures: ASME A112.19.2M.
 9. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucet Hose: ASTM D 3901.
 5. Faucets: ASME A112.18.1M.
 6. Hose-Connection Vacuum Breakers: ASSE 1011.
 7. Hose-Coupling Threads: ASME B1.20.7.
 8. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 9. NSF Materials: NSF 61.

10. Pipe Threads: ASME B1.20.1.
 11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 12. Supply and Drain Fittings: ASME A112.18.1M.
- J. Comply with the following applicable standards and other requirements specified for shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1M.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1M.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Plastic Tubular Fittings and Piping: ASTM F 409.
 5. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
- L. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Floor Drains: ASME A112.21.1M.
 3. Grab Bars: ASTM F 446.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. Off-Floor Fixture Supports: ASME A112.6.1M.
 6. Pipe Threads: ASME B1.20.1.
 7. Plastic Shower Receptors: ANSI Z124.2.
 8. Plastic Toilet Seats: ANSI Z124.5.
 9. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
 3. Faucet, Flow-Control Fittings: Equal to 10 percent of amount of each type and size installed.
 4. Supply, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
 5. Shower, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
 6. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but not less than 12 of each type.
 7. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
 8. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

- A. Lavatory Faucet, <L-1 & L-2>: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Maximum Flow Rate: 0.5 gpm, unless otherwise indicated.
 2. Body Material: Cast brass.
 3. Finish: Polished chrome plate.
 4. Type: Single-control mixing.
 5. Centers: 4 inches (102 mm).
 6. Mounting: Deck, exposed.
 7. Handle(s): Lever.
 8. Inlet(s): NPS 1/2 (DN 15) male adaptor.
 9. Spout: Rigid.
 10. Spout Outlet: Aerator.
 11. Operation: Compression, manual.
 12. Drain: Grid.
 13. Tempering Device: Not required.

2.2 SHOWER FAUCETS

- A. Shower Faucet, <SH-1>: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.

1. Maximum Flow Rate: 1.5 gpm (9.5 L/min.), unless otherwise indicated.
2. Body Material: Cast brass.
3. Finish: Polished chrome plate.
4. Type: Single-handle pressure balance with integral or field-installed check stops on hot- and cold-water supplies.
5. Mounting: Concealed.
6. Handle[s]: Lever.
7. Diverter Valve: Not required.
8. Backflow Protection Device for Hand-Held Shower: Required.
9. Operation: Noncompression, manual
10. Antiscald Device: Not required.
11. Supply Connections: NPS 1/2 (DN 15) Sweat.
12. Shower Head Material: Combined, metallic and nonmetallic with chrome-plated finish.
13. Head Type: Hand held, slide-bar mounted.
14. Spray Pattern: Adjustable.
15. Integral Volume Control: Not Required.
16. Shower-Arm, Flow-Control Fitting: 1.5 gpm (5.7 L/min.).

2.3 SINK FAUCETS

- A. Sink Faucet, <SK-1>: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Maximum Flow Rate: 2.5 gpm (9.5 L/min.), unless otherwise indicated.
2. Body Material: Cast brass.
3. Finish: Polished chrome plate.
4. Type: Kitchen faucet without spray.
5. Mixing Valve: Two-lever handle.
6. Centers: 8 inches (203 mm).
7. Mounting: Deck, exposed.
8. Handle[s]: Wrist blade, 4 inches (100 mm).
9. Inlet[s]: NPS 1/2 (DN 15) male shank.
10. Spout: Rigid, cast.
11. Spout Outlet: Aerator.
12. Vacuum Breaker: Not required.
13. Operation: Noncompression, manual.
14. Drain: Not required.
15. Tempering Device: Not required.

2.4 FLUSHOMETERS

- A. Flushometer, <UR-1 & UR-2 >: Cast-brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, and copper or brass tubing, and polished chrome-plated finish on exposed parts.

1. Internal Design: Diaphragm operation.
2. Style: Exposed.
3. Inlet Size: NPS 3/4.

4. Trip Mechanism: Oscillating, lever-handle actuator.
5. Consumption: 0.5 gal./flush (1.9 L/flush).
6. Tailpiece Size: NPS 3/4 (DN 20) and standard length to top of bowl.

2.5 TOILET SEATS

- A. Toilet Seat, <WC-1 & WC-2>: Solid plastic.
 1. Configuration: Open front without cover.
 2. Size: Elongated.
 3. Class: Heavy-duty commercial.
 4. Hinge Type: SC, self-sustaining, check.
 5. Color: White.

2.6 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Guard, <L-2>: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.

2.7 FIXTURE SUPPORTS

- A. Urinal Support, <UR-1 & UR-2>: Type II, urinal carrier with hanger and bearing plates. Include steel uprights with feet.
 1. Accessible Fixture Support: Include rectangular steel uprights.
- B. Lavatory Support, <L-2>: Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
 1. Accessible Fixture Support: Include rectangular steel uprights.
- C. Drinking Fountain Support, <EDF-1 & EDF-2>: Type II, bi-level water cooler carrier with universal steel support plates and plated hardware. Include steel uprights with feet.
 1. Accessible Fixture Support: Include rectangular steel uprights.

2.8 DISPOSERS

- A. Disposer, <GD-1>: Continuous-feed, household, food-waste disposer. Include 115-V ac, 1725-rpm, 1/2-hp motor with overload protection and reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 (DN 40) outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
 1. Model: Sound-insulated chamber.

2.9 WATER CLOSETS

- A. Water Closets, <WC-1>: Floor-mounting, floor-outlet, vitreous-china fixture designed for flushometer tank operation.
1. Style: Flushometer valve.
 - a. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
 - b. Height: Standard.
 - c. Design Consumption: 1.28 gal./flush.
 - d. Tank: Flushometer-tank type with trim and pressurized tank. Include cover.
 - e. Trip Mechanism: Lever-handle.
 - f. Color: White.
 2. Toilet Seat: WC-1.
- B. Water Closets, <WC-2>: Accessible, floor-mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Style: Flushometer valve.
 - a. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
 - b. Height: Accessible.
 - c. Design Consumption: 1.28 gal./flush.
 - d. Tank: Flushometer-tank type with trim and pressurized tank. Include cover.
 - e. Trip Mechanism: Lever-handle.
 - f. Color: White.
 2. Toilet Seat: WC-2.

2.10 URINALS

- A. Urinals, <UR-1>: Wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Type: Washout with extended shields.
 2. Strainer or Trapway: Integral cast strainer with integral trap.
 3. Design Consumption: 0.5 gal./flush (1.9 L/flush).
 4. Color: White.
 5. Supply Spud Size: NPS 3/4 (DN 20).
 6. Outlet Size: NPS 2 (DN 50).
 7. Flushometer: <UR-1.>
 8. Fixture Support: Urinal <UR-1> chair carrier.
- B. Urinals, <UR-2>: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Type: Washout with extended shields.
 2. Strainer or Trapway: Integral cast strainer with integral trap.
 3. Design Consumption: 0.5 gal./flush (1.9 L/flush).

4. Color: White.
5. Supply Spud Size: NPS 3/4 (DN 20).
6. Outlet Size: NPS 2 (DN 50).
7. Flushometer: <UR-2.>
8. Fixture Support: Urinal <UR-2> chair carrier.

2.11 LAVATORIES

- A. Lavatories, <L-1>: Accessible, wall-hanging, vitreous-china fixture.

1. Type: With back.
2. Size: 20 by 18 inches (508 by 457 mm) rectangular.
3. Faucet Hole Punching: Three, 2-inch (51-mm) centers, holes.
4. Faucet Hole Location: Top.
5. Color: White.
6. Faucet: Lavatory <L-1>.
7. Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.
8. Drain: See faucet.
9. Drain Piping: NPS 1-1/4 (DN 32) chrome-plated cast-brass trap; NPS 1-1/4 (DN 32), 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; and wall escutcheon.
10. Protective Shielding Guard[s]: <L-1.>
11. Fixture Support: Lavatory <L-1.>

- B. Lavatories, <L-2>: Accessible, drop-in bowl.

1. Faucet Hole Punching: Three, 2-inch (51-mm) centers, holes.
2. Faucet Hole Location: Top.
3. Faucet: Lavatory <L-2>.
4. Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.
5. Drain: See faucet.
6. Drain Piping: NPS 1-1/4 (DN 32) chrome-plated cast-brass trap; NPS 1-1/4 (DN 32), 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; and wall escutcheon.
7. Protective Shielding Guards: Not Required

2.12 INDIVIDUAL SHOWERS

- A. Individual Showers, <SH-1>: Built-up unit by Division 6.

1. Faucet: Shower <SH-1>.
2. Drain: Grid, NPS 2 (DN 50).

2.13 KITCHEN SINKS

- A. Bar Sinks, <SK-1>: Commercial, single-compartment, counter-mounting, stainless-steel fixture.

1. Size: 19 by 18 inches (483 by 457 mm).

2. Sink Faucet: <SK-1>.
3. Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.
4. Drain: 1-1/2-inch (38-mm) crumb cup.
5. Drain Piping: NPS 1-1/2 (DN 40) chrome-plated cast-brass trap, 0.045-inch- (1.1-mm-) thick tubular brass waste to wall, and wall escutcheon.

2.14 SERVICE BASINS

- A. Service Basins, <MS-1>: Flush-to-wall, floor-mounting precast terrazzo basin with rim guard.

1. Shape: Square.
2. Size: 24 by 24 inches (610 by 610 mm).
3. Height: 10 inches (255 mm).
4. Tiling Flange: On three sides.
5. Rim Guard: On front top surfaces.
6. Color: White.
7. Faucet: Sink <MS-1>.
8. Drain: Grid with NPS 3 (DN 80) outlet.

- B. Service Basins, <MS-2>: Flush-to-wall, floor-mounting precast terrazzo basin with rim guard.

1. Shape: Square.
2. Size: 36 by 24 inches (610 by 610 mm).
3. Height: 12 inches.
4. Tiling Flange: On three sides.
5. Rim Guard: On front top surfaces.
6. Color: White.
7. Faucet: Sink <MS-1>
8. Drain: Grid with NPS 3 (DN 80) outlet.

- A. Service Basins, <MS-3>: Trap-standard- and wall-mounting, enameled, cast-iron fixture with roll-rim with two faucet holes in back and rim guard on front and sides.

1. Size: 24 by 200 inches.
2. Tiling Flange: On three sides.
3. Rim Guard: On front top surfaces.
4. Color: White.
5. Faucet: Sink <MS-3>
6. Drain: Grid with NPS 3 (DN 80) outlet.
7. Trap Standard: NPS 3 (DN 80) enameled, cast iron with cleanout and floor flange.
- 8.

2.15 ELECTRIC DRINKING FOUNTAINS

- A. Electric Drinking Fountains <EDF-1>: Stainless steel, wall mounted.

1. Standards:

- a. Comply with ASME A112.19.3/CSA B45.4.
 - b. Comply with NSF 61.
 2. Type Receptor: Bi-Level.
 3. Receptor Shape: Rectangular.
 4. Back Panel: Stainless-steel wall plate behind drinking fountain.
 5. Bubblers: Two with adjustable stream regulator, located on deck.
 6. Control: Push bar.
 7. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
 8. Supply Piping: NPS 3/8 (DN 10) with shutoff valve.
 9. Drain Piping: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) chrome-plated brass P-trap and waste.
 10. Support: ASME A112.6.1M, Type III water cooler carrier.
- B. Electric Drinking Fountains <EDF-2>: Stainless steel, wall mounted.
1. Standards:
 - a. Comply with ASME A112.19.3/CSA B45.4.
 - b. Comply with NSF 61.
 2. Type Receptor: Single
 3. Receptor Shape: Rectangular.
 4. Back Panel: Stainless-steel wall plate behind drinking fountain.
 5. Bubblers: One with adjustable stream regulator, located on deck.
 6. Control: Push bar.
 7. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
 8. Supply Piping: NPS 3/8 (DN 10) with shutoff valve.
 9. Drain Piping: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) chrome-plated brass P-trap and waste.
 10. Support: ASME A112.6.1M, Type I water cooler carrier.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.
- G. Install counter-mounting fixtures in and attached to casework.
- H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.
- J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- M. Install toilet seats on water closets.
- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

- P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
- R. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- S. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- T. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- U. Set shower receptors and service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for grout.
- V. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- F. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust disposers and controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15430

PLUMBING 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 plumbing specialties:
 - 1. Backflow preventers.
 - 2. Balancing valves.
 - 3. Thermostatic water mixing valves.
 - 4. Strainers.
 - 5. Outlet boxes.
 - 6. Key-operation hydrants.
 - 7. Trap seal primer valves.
 - 8. Drain valves.
 - 9. Miscellaneous piping specialties.
 - 10. Sleeve penetration systems.
 - 11. Flashing materials.
 - 12. Cleanouts.
 - 13. Floor drains.
 - 14. Roof drains.
- B. Related Sections include the following:
 - 1. Division 15 Section "Meters and Gages" for water meters, thermometers, and pressure gages.

1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic piping materials:
 - 1. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Piping: 125 psig (860 kPa).
 - 2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
 - 3. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
 - 1. Backflow preventers and water regulators.
 - 2. Balancing valves, water filters, and strainers.
 - 3. Water hammer arresters, air vents, and trap seal primer valves and systems.
 - 4. Drain valves, hose bibbs, and hydrants.
 - 5. Outlet boxes outlets.
 - 6. Cleanouts, floor drains, open receptors, trench drains, and roof drains.
 - 7. Air-admittance valves, vent caps, vent terminals, and roof flashing assemblies.
 - 8. Sleeve penetration systems.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field test reports.
- D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:
 - 1. Backflow preventers and water regulators.
 - 2. Trap seal primer valves and systems.
 - 3. Hose stations and hydrants.

1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dww" on plastic drain, waste, and vent piping.
 - 2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

- A. General: ASSE standard, backflow preventers.
 - 1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
 - 2. Interior Components: Corrosion-resistant materials.
 - 3. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
 - 4. Strainer: On inlet, if indicated.
- B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.
- C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- D. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.
 - 1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.
- E. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and two independent check valves.
- F. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm (0.19-L/s) flow and applications with up to 10-foot head of water (30-kPa) back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.

2.2 STRAINERS

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.
 - 1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.

2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.
 - a. Drain: Pipe plug.

2.3 OUTLET BOXES

- A. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.
- B. IceMaker Outlet Boxes: With hose connection and the following:
 1. Box and Faceplate: Plastic.
 2. Shutoff Fitting: Hose bibb.
 3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.
- C. Washing Machine Outlet Boxes: With hose connection and the following:
 1. Box and Faceplate: Plastic.
 2. Shutoff Fitting: Hose bibb.
 3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.
 4. Drain: NPS 2 with p-trap.
- D. Reinforcement: 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."

2.4 KEY-OPERATION HYDRANTS

- A. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa).
 1. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) threaded or solder joint.
 2. Outlet: ASME B1.20.7, garden-hose threads.
 3. Operating Keys: Two with each key-operation hydrant.
- B. Nonfreeze Exposed-Outlet Wall Hydrants: ASSE 1019, self-drainable with integral nonremovable hose-connection vacuum breaker, casing and operating rod to match wall thickness, projecting outlet, and wall clamp.
 1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
 2. Nozzle and Wall Plate Finish: Rough bronze.

2.5 WHEEL-HANDLE WALL HYDRANTS

- A. Description: Frost-proof design similar to ASME A112.21.3M, for wall mounting with wheel-handle operation, NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, casing and operating rod to match wall thickness, and projecting outlet with ASME B1.20.7 garden-hose threads on outlet. Include wall clamp; integral vacuum breaker or nonremovable, drainable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose threads complying with ASME B1.20.7 on outlet.

2.6 TRAP SEAL PRIMER VALVES

- A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
 - 1. 125-psig (860-kPa) minimum working pressure.
 - 2. Bronze body with atmospheric-vented drain chamber.
 - 3. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
 - 4. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:
 - 1. Chrome-plated, cast-brass, NPS 1-1/4 (DN 32) minimum, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.
- C. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:
 - 1. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing inlet and manifold with number of NPS 1/2 (DN 15) outlets as indicated.
 - 2. Cabinet: Steel box with stainless-steel cover.
 - 3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 - 4. Water Hammer Arrester: ASSE 1010.
 - 5. Vacuum Breaker: ASSE 1001.

2.7 DRAIN VALVES

- A. Hose-End Drain Valves: MSS SP-110, NPS 3/4 (DN 20) ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.
 - 1. Inlet: Threaded or solder joint.
 - 2. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.

2.8 MISCELLANEOUS PIPING SPECIALTIES

- A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
- B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral or field-installed, nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.
 - 1. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
 - 2. Finish for Finished Rooms: Chrome or nickel plated.
 - 3. Operation for Equipment Rooms: Wheel handle or operating key.
 - 4. Operation for Finished Rooms: Operating key.
 - 5. Include operating key with each operating-key hose bibb.
 - 6. Include integral wall flange with each chrome- or nickel-plated hose bibb.
- C. Air Vents: Float type for automatic air venting.
 - 1. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 (DN 10) minimum inlet, 150-psig (1035-kPa) minimum pressure rating, and threaded vent outlet.
- D. Air-Admittance Valves: Plastic housing with mechanical-operation sealing diaphragm, designed to admit air into drainage and vent piping and to prevent transmission of sewer gas into building.
 - 1. Stack Vent Valve: ASSE 1050, designed for installation as terminal on soil, waste, and vent stacks, instead of stack vent extending through roof, in NPS 2 to NPS 4 (DN 50 to DN 100).
 - 2. Fixture Vent Valve: ASSE 1051, designed for installation on waste piping, instead of vent connection, for single fixture, in NPS 1-1/4 to NPS 2 (DN 32 to DN 50).
- E. Roof Flashing Assemblies: Manufactured assembly made of 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
 - 1. Open-Top Vent Cap: Without cap.
 - 2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
 - 3. Extended Vent Cap: With field-installed, vandal-proof vent cap.
- F. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting, joined with ASTM C 564, rubber gaskets.
- G. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap seal primer valve connection.
 - 1. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
 - 2. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

- H. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- I. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semio-pen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.
- J. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- K. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.
- L. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.
- M. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.
- N. Downspout Boots: ASTM A 48 (ASTM A 48M), gray-iron casting, with NPS 4 (DN 100) outlet; shop-applied bituminous coating; and inlet size to match downspout.
- O. Conductor Nozzles: Bronze body with threaded inlet for connected conductor size, and bronze wall flange with mounting holes.
 - 1. Finish: Polished bronze.

2.9 SLEEVE PENETRATION SYSTEMS

- A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
 - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
 - 2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
 - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.10 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.

2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Copper Sheet: ASTM B 152 (ASTM B 152M), of the following minimum weights and thicknesses, unless otherwise indicated:
1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
 2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.11 CLEANOUTS

- A. Cleanouts, <CO>: Comply with ASME A112.36.2M.
1. Body or Ferrule Material: Cast iron.
 2. Clamping Device: Required.
 3. Outlet Connection: Inside calk or Spigot.
 4. Closure: Brass plug with straight threads and gasket.
 5. Adjustable Housing Material: Cast iron with threads.
 6. Frame and Cover Shape: Round
 7. Top Loading Classification: Medium Duty.
- B. Wall Cleanouts, <WCO>: Comply with ASME A112.36.2M and ASME A112.3.1.
1. Body or Ferrule Material: Cast iron or Plastic.
 2. Clamping: Not required.
 3. Outlet Connection: Spigot]
 4. Closure: Brass plug with straight threads and gasket.
 5. Adjustable Housing Material: Cast iron or Plastic with threads.
 6. Frame and Cover Material and Finish: Stainless steel.
 7. Frame and Cover Shape: Round.

2.12 FLOOR DRAINS

- A. Floor Drains, <FD-1>: Comply with ASME A112.21.1M.

1. Application: Floor drain
2. Body Material: Gray iron.
3. Seepage Flange: Not required.
4. Clamping Device: Not required.
5. Outlet: Bottom .
6. Exposed Surfaces and Interior Lining: Not required.
7. Wall Plate Material: Stainless steel.
8. Wall Plate Shape: Round.

2.13 ROOF DRAINS

A. Roof Drains, <RD-1>: Comply with ASME A112.21.2M.

1. Body Material: Cast iron.
2. Dimensions of Body: Round, 9-inch unit.
3. Combination Flashing Ring and Gravel Stop: Required.
4. Outlet: Bottom.
5. Dome Material: Cast iron.
6. Extension Collars: Not required.
7. Underdeck Clamp: Required.
8. Sump Receiver: Not required.

B. Roof Drains, <OD-1> Comply with ASME A112.21.2M.

1. Body Material: Cast iron.
2. Dimensions of Body: Round, 9-inch unit.
3. Combination Flashing Ring and Gravel Stop: Required
4. Outlet: Bottom.
5. Dome Material: Cast iron.
6. Extension Collars: Required.
7. Underdeck Clamp: Required.
8. Sump Receiver: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap

- device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.
- C. Install pressure gages on inlet and outlet.
 - D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.
 - E. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
 - F. Install expansion joints on vertical risers, stacks, and conductors if indicated.
 - G. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 4. Locate at base of each vertical soil and waste stack.
 - H. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
 - I. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
 - J. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
 - K. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
 - L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.
 - M. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- N. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 2. Position roof drains for easy access and maintenance.
- O. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- P. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- Q. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- R. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
- S. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- T. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.
- D. Ground equipment.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer and trap seal primer system.
 - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 2. Refer to Division 15 Section "Basic Plumbing Materials and Methods" for nameplates and signs.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 15530

FURNACES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Gas-fired, condensing furnaces and accessories complete with controls.
 - 2. Air filters.
 - 3. Refrigeration components.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:
 - 1. Furnace.
 - 2. Thermostat.
 - 3. Air filter.
 - 4. Refrigeration components.
- B. Operation and maintenance data.
- C. Warranty.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Comply with NFPA 70.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
 - 1. Warranty Period, Commencing on Date of Substantial Completion:

- a. Furnace Heat Exchanger: 10 years.
- b. Integrated Ignition and Blower Control Circuit Board: three years.
- c. Draft-Inducer Motor: Five years.
- d. Refrigeration Compressors: 5 years.
- e. Evaporator and Condenser Coils: Five years.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES, CONDENSING

- A. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
- B. Cabinet: Steel.
 - 1. Cabinet interior around heat exchanger shall be factory-installed insulation.
 - 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
 - 3. Factory paint external cabinets in manufacturer's standard color.
 - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.
- C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
 - 1. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 2. Special Motor Features: Single speed, Premium (TM) efficiency, as defined in Division 23 Section "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
 - 3. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.
- D. Type of Gas: Natural.
- E. Heat Exchanger:
 - 1. Primary: Aluminized steel.
 - 2. Secondary: Stainless steel.
- F. Burner:
 - 1. Gas Valve: 100 percent safety main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
 - 2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- G. Gas-Burner Safety Controls:
 - 1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
 - 2. Flame Rollout Switch: Installed on burner box; prevents burner operation.

3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- J. Accessories:
 1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
 2. CPVC Plastic Vent Materials.
 - a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
 - b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
 - c. CPVC Solvent Cement: ASTM F 493.
 - 1) Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2) Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. PVC Plastic Vent Materials:
 - a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
 - b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
 - c. PVC Solvent Cement: ASTM D 2564.
 - 1) Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2) Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 THERMOSTATS

- A. Solid-State Thermostat: Wall-mounting, programmable, microprocessor-based unit with [automatic] [manual] switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, and battery backup protection against power failure for program settings.
- B. Control Wiring: Unshielded twisted-pair cabling.

1. No. 24 AWG, 100 ohm, four pair.

C. Controls shall comply with requirements in ASHRAE/IESNA 90.1-2007, "Controls."

2.3 AIR FILTERS

- A. Disposable Filters: 1-inch- (25-mm-) thick fiberglass media[with ASHRAE 52.2 MERV rating of 6 or higher in sheet metal frame.

2.4 REFRIGERATION COMPONENTS

A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2010, "Energy Standard for Buildings except Low-Rise Residential Buildings."

B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1-2007.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 1 inch (25 mm) thick.

D. Refrigerant Piping: Comply with requirements in Division 23 Section "Refrigerant Piping."

E. Air-Cooled, Compressor-Condenser Unit:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed scroll type.
 - a. Crankcase heater.
 - b. Vibration isolation mounts for compressor.
 - c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

- d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
- e. Refrigerant Charge: R-410A.
- f. Refrigerant: R-410A.
- 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
- 4. Heat-Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- 5. Fan: Aluminum-propeller type, directly connected to motor.
- 6. Motor: Permanently lubricated, with integral thermal-overload protection.
- 7. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).
- 8. Mounting Base: Polyethylene.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
 - 1. Install seismic restraints to limit movement of furnace by resisting code-required seismic acceleration.
- C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
 - 1. Anchor furnace to substrate to resist code-required seismic acceleration.
- D. Controls: Install thermostats and humidistats at mounting height of 60 inches (1500 mm) above floor.
- E. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.
- F. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- G. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

3.2 CONNECTIONS

- A. Gas piping installation requirements are specified in Division 23 Section "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Water piping installation requirements are specified in Division 22 Section "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect water piping with union and ball valve.
- D. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors. Type B vents and their installation requirements are specified in Division 23 Section "Breechings, Chimneys, and Stacks."
- E. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - c. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - d. Requirements for Low-Emitting Materials:
 - 1) Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2) Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3) Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 4. Slope pipe vent back to furnace or to outside terminal.
- F. Connect ducts to furnace with flexible connector. Comply with requirements in Division 23 Section "Air Duct Accessories."

- G. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled, compressor-condenser unit.
 - 1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
 - 2. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
 - 3. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- H. Comply with requirements in Division 23 Section "Refrigerant Piping" for installation and joint construction of refrigerant piping.
- I. Complete installation and startup checks and start units according to manufacturer's written instructions.
- J. Verify proper operation of capacity control device.
- K. Adjust airflow and initial temperature and humidity set points.
- L. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.
- M. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- N. Install new filters in each furnace within 14 days after Substantial Completion.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

END OF SECTION

SECTION 15738

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Operation and maintenance data.
- D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. Applicable requirements in ASHRAE 62.1-2010, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-Up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:
 - a. For Compressor: Five year(s) from date of Substantial Completion.
 - b. For Parts: One year from date of Substantial Completion.
 - c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 INDOOR UNITS 5 TONS (18 kW) OR LESS

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
4. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements.
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
8. Filters: Permanent, cleanable.
9. Condensate Drain Pans:
 - a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2007.
 - 2) Depth: A minimum of 2 inches (50 mm) deep.
 - b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.

- c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
- d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
- e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

B. Floor-Mounted, Evaporator-Fan Components:

- 1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect.
 - a. Discharge Grille: Steel with surface-mounted frame.
 - b. Insulation: Faced, glass-fiber duct liner.
 - c. Drain Pans: Galvanized steel, with connection for drain; insulated.
- 2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
- 3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
- 4. Fan: Direct drive, centrifugal, with power-induced outside air.
- 5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements.
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
- 6. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
 - b. Disposable Panel Filters:
 - 1) Factory-fabricated, viscous-coated, flat-panel type.
 - 2) Thickness: 1 inch (25 mm).
 - 3) Arrestance according to ASHRAE 52.1: 80.
 - 4) Merv according to ASHRAE 52.2: 5.
 - 5) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
 - 6) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

C. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 - f. Mount unit-mounted disconnect switches on exterior of unit.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
7. Condensate Drain Pans:
 - a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2007.
 - 2) Depth: A minimum of 1 inch (25 mm) deep.
 - b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
 - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
8. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.

- 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS (5 TONS (18 kW) OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant Charge: R-407C or R-410A.
 - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid sub-cooler. Comply with ARI 210/240.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 1. Compressor time delay.
 2. 24-hour time control of system stop and start.
 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 4. Fan-speed selection including auto setting.
- C. Automatic-reset timer to prevent rapid cycling of compressor.
- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base that is 4 inches (100 mm) larger, on each side, than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- D. Install roof-mounted, compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- E. Install seismic restraints.
- F. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch (25 mm). See Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- G. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - 1. Water Coil Connections: Comply with requirements specified in Division 23 Section "Hydronic Piping." Connect hydronic piping to supply and return coil connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 - 2. Remote, Water-Cooled Condenser Connections: Comply with requirements specified in Division 23 Section "Hydronic Piping." Connect hydronic piping to supply and return connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts" Drawings indicate the general arrangement of ducts. Connect

supply ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 1. Seismic Hazard Level D:
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:

C.
D.

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

E. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Penetrations of smoke barriers and fire-rated construction.
5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Sprinklers.

B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface

finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
 - 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- D. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers

and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.

3.7 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 2. Ducts Connected to Variable-Volume Air-Handling Units:
 - a. Pressure Class: Positive 4-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - 3. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 4. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
- C. Return Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.

- c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
- 3. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
- D. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 3. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:
 - a. Type 304, stainless-steel sheet.
 - 1) Exposed to View: No. 3 finish.
 - 2) Concealed: No. 2D finish.
 - b. PVC-coated, galvanized sheet steel with thicker coating on duct interior.
 - c. Pressure Class: Positive or negative 3-inch wg.
 - d. Minimum SMACNA Seal Class: A.
 - e. SMACNA Leakage Class: 3.
 - 4. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
- b. Minimum SMACNA Seal Class: C.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 24.

2. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 24.

3. Ducts Connected to Equipment Not Listed Above:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 24.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

2. PVC-Coated Ducts:

- a. Exposed to Airstream: Match duct material.
- b. Not Exposed to Airstream: Galvanized.

3. Stainless-Steel Ducts:

- a. Exposed to Airstream: Match duct material.
- b. Not Exposed to Airstream: Match duct material.

4. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

- 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
- 2) Mitered Type RE 4 without vanes.

- b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
2. Round and Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity or Higher: 45-degree lateral.

END OF SECTION

SECTION 15820

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Fire dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

1.2 SUBMITTALS

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

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - d. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Description: Gravity balanced.
- B. Maximum Air Velocity: 2000 fpm (10 m/s).
- C. Maximum System Pressure: 2-inch wg (0.5 kPa).
- D. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.
- E. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.
- F. Blade Action: Parallel.

- G. Blade Seals: Neoprene, mechanically locked.
- H. Blade Axles:
 - 1. Material: Nonferrous metal or Galvanized steel.
 - 2. Diameter: 0.20 inch (5 mm).
- I. Tie Bars and Brackets: Galvanized steel.
- J. Return Spring: Adjustable tension.
- K. Bearings: Steel ball or synthetic pivot bushings.
- L. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
 - b. Sleeve Length: 6 inches (152 mm) minimum.
 - 4. Screen Mounting: Rear mounted.
 - 5. Screen Material: Galvanized steel.
 - 6. Screen Type: Bird.
 - 7. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
 - 5. Blade Axles: Galvanized steel or Nonferrous metal.
 - 6. Bearings:

- a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
 - 5. Blade Axles: Galvanized steel or Nonferrous metal.
 - 6. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 7. Tie Bars and Brackets: Aluminum.
- C. Jackshaft:
 - 1. Size: 1-inch (25-mm) diameter.
 - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- D. Damper Hardware:
 - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
 - 2. Include center hole to suit damper operating-rod size.
 - 3. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

- A. Type: Static; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- C. Fire Rating: 1-1/2 and 3 hours.
- D. Frame: Curtain type with blades inside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- J. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F (74 deg C) and 212 deg F (100 deg C) rated.

2.5 FLANGE CONNECTORS

- A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.
- D. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

- E. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- F. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- G. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.6 DUCT-MOUNTED ACCESS DOORS

- A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.
- B. Pressure Relief Access Door:
 - 1. Door and Frame Material: Galvanized sheet steel.
 - 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
 - 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
 - 4. Factory set at 10-inch wg (2500 Pa).
 - 5. Doors close when pressures are within set-point range.

6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.7 DUCT ACCESS PANEL ASSEMBLIES

- A. Labeled according to UL 1978 by an NRTL.
- B. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.
- C. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- D. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).
- E. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.8 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
- E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
 2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
 3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.9 FLEXIBLE DUCTS

- A. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.
 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
- B. Noninsulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire.
 1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
- C. Noninsulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.
 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
- D. Noninsulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire.
 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
- E. Noninsulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil.

1. Pressure Rating: 8-inch wg (2280 Pa) positive or negative.
 2. Maximum Air Velocity: 5000 fpm (25 m/s).
 3. Temperature Range: Minus 100 to plus 435 deg F (Minus 73 to plus 224 deg C).
- F. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- G. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- H. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- I. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- J. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
1. Pressure Rating: 8-inch wg (2280 Pa) positive or negative.
 2. Maximum Air Velocity: 5000 fpm (25 m/s).
 3. Temperature Range: Minus 20 to plus 250 deg F (Minus 29 to plus 121 deg C).
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

K. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.10 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 2. Control devices requiring inspection.
 3. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
 4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 5. Body Access: 25 by 14 inches (635 by 355 mm).
 6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- K. Install flexible connectors to connect ducts to equipment.
- L. Connect terminal units to supply ducts directly or with maximum 6-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.
- M. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with draw bands.
- O. Install duct test holes where required for testing and balancing purposes.
- P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 4. Inspect turning vanes for proper and secure installation.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. In-line centrifugal fans.

1.2 SUBMITTALS**A. Product Data:** For each type of product indicated.**B. Shop Drawings:** Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

C. Operation and maintenance data.**1.3 QUALITY ASSURANCE****A. Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.**B. AMCA Compliance:** Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.**PART 2 - PRODUCTS****2.1 CENTRIFUGAL ROOF VENTILATORS****A. Housing:** Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

- B. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- C. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 5. Fan and motor isolated from exhaust airstream.
- D. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 - 5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- E. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.
 - 1. Configuration: Self-flashing without a cant strip, with mounting flange.
 - 2. Overall Height: 12 inches (300 mm).
 - 3. Pitch Mounting: Manufacture curb for roof slope.

2.2 CEILING-MOUNTED VENTILATORS

- A. Housing: Steel, lined with acoustical insulation.
- B. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- C. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- D. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.3 IN-LINE CENTRIFUGAL FANS

- A. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- B. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- C. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 3. Companion Flanges: For inlet and outlet duct connections.
 4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.5 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Division 07 Section "Roof Accessories" for installation of roof curbs.
- B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- C. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch (25 mm). Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 15855

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.
4. Linear slot diffusers.
5. Adjustable bar registers and grilles.
6. Fixed face registers and grilles.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material: Steel
3. Material for MRI: Non-ferrous.
4. Material for Pool area: Aluminum.
5. Finish: Baked enamel, white.
6. Face Size Supply: 24 by 24 inches (600 by 600 mm)
7. Face Size Exhaust: 12 by 12 inches (300 by 300 mm).
8. Face Style: Four cone.
9. Mounting: T-bar.

10. Pattern: Fixed.
11. Dampers: Radial opposed blade.
12. Flush mount only – step down not acceptable!

B. Perforated Diffuser:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material: Steel backpan and pattern controllers, with steel face.
3. Finish: Baked enamel, white.
4. Face Size: 24 by 12 inches (600 by 300 mm).
5. Duct Inlet: Round.
6. Face Style: Flush.
7. Mounting: T-bar.
8. Pattern Controller: Fixed with curved blades at inlet.
9. Dampers: Radial opposed blade.
10. Accessories:
 - a. Equalizing grid.
 - b. Plaster ring.
 - c. Operating rod extension.

C. Louver Face Diffuser:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material: Steel
3. Material for MRI: Non-ferrous.
4. Material for Pool area: Aluminum.
5. Finish: Baked enamel, white.
6. Face Size: 24x24 inches.
7. Mounting: T-bar.
8. Pattern: Four-way core style.
9. Dampers: Radial opposed blade.
10. Accessories:
 - a. Square to round neck adaptor.
 - b. Plaster ring (see plans if req'd).
 - c. Operating rod extension.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Slot Diffusers:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material - Shell: Steel, insulated.
3. Material - Shell: Aluminum, insulated (pool area).
4. Material - Pattern Controller and Tees: Aluminum.
5. Finish - Face and Shell: Baked enamel, black.
6. Finish - Pattern Controller: Baked enamel, black.
7. Finish - Tees: Baked enamel, white.
8. Slot Width: 1 inch (25 mm).
9. Number of Slots: Four.
10. Length: 36 inches (900 mm) or 48 inches (1200 mm).

11. Accessories: Plaster frame, T-bar slot, T-bar on inlet side, T-bar on both sides, (refer to drawings).

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Grille:

1. Material: Steel.
2. Material: Aluminum (pool area).
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch (19 mm) apart.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch (19 mm) apart.
7. Frame: 1-1/4 inches (32 mm) wide.
8. Mounting: Countersunk screw.

B. Fixed Face Register:

1. Material: Steel.
2. Finish: Baked enamel, white.
3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
4. Core Construction: Integral.
5. Frame: 1-1/4 inches (32 mm) wide.
6. Mounting: Countersunk screw.
7. Damper Type: Adjustable opposed blade.
8. Accessory: Filter (see plans)

C. Fixed Face Grille:

1. Material: Steel.
2. Finish: Baked enamel, white.
3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
4. Core Construction: Integral.
5. Frame: 1-1/4 inches (32 mm) wide.
6. Mounting: Countersunk screw.
7. Damper Type: Adjustable opposed blade.
8. Accessory: Filter (see plans)

2.4 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.

- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 ACTION SUBMITTALS**1.4 INFORMATIONAL SUBMITTALS**

- A. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Owner or Commissioning Authority.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.
- 3.2 PREPARATION
- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
1. Permanent electrical-power wiring is complete.
 2. Automatic temperature-control systems are operational.
 3. Equipment and duct access doors are securely closed.
 4. Balance, smoke, and fire dampers are open.
 5. Isolating and balancing valves are open and control valves are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.

- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 6. Obtain approval from Owner or Commissioning Authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur.

Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.7 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing.

Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.8 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB contractor.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.

- d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Inlet vane settings for variable-air-volume systems.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 - 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Duct, outlet, and inlet sizes.
 - 3. Pipe and valve sizes and locations.
 - 4. Terminal units.
 - 5. Balancing stations.
 - 6. Position of balancing devices.

3.9 ADDITIONAL TESTS

- A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 16050

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electrical installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.

- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes: Grounding systems and equipment.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- C. Comply with IEEE 1692-2015 and IEEE 1100-2005 for communications room halo ground system.

PART 2 - PRODUCTS**2.1 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick
 - 8. Halo Ground: No. 2/0 bare stranded copper conductor.
 - 9. Halo Ground Down Conductors: No. 2/0 stranded conductor, insulation colored as isolated ground.

- C. Wall Mount Insulated Standoffs for Halo Ground: Harger HSC100CR56, ALT 3890, or approved equal

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Communication Room Halo Ground
 - 1. Bare Copper Halo Ring: Suspend on insulated standoffs 2" from wall at 6" below upper deck above ceiling. Install standoffs to each wall stud, no more than 20" center to center.
 - 2. Install down conductors within walls to ground rods at each corner of the room.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Armored and metal-clad cable runs.
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- E. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.
- B. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 ACTION SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Trapeze hangers. Include Product Data for components.
 2. Steel slotted channel systems. Include Product Data for components.
 3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other]support system, sized so capacity can be increased by at least [25] <Insert number> percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS**2.1 POWER RACEWAY IDENTIFICATION MATERIALS**

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less:
Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage.
- C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE, .
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.7 INSTRUCTION SIGNS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 21-foot (7-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
 - 4. Fire alarm

- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION

SECTION 16120

MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cables, splices, terminations, and accessories for medium-voltage electrical distribution systems.

1.2 SUBMITTALS

- A. Product Data: For each type of cable, splice and termination.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C2 and NFPA 70.

PART 2 - PRODUCTS

2.1 CABLES

- A. THHN or equal for insulation.
- B. Cable Type: MV90, with copper conductor and concentric lay, class B stranding.
- C. Comply with UL-1072, AEIC CS8, ICEA S-93-639, and ICEA S-97-682.
- D. Strand Filling: Conductor interstices are filled with impermeable compound.
- E. Conductor Insulation: Crosslinked polyethylene.
- F. Shielding: Copper tape, helically applied over semiconducting insulation shield.
- G. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.
- H. Cable Jacket: Sunlight-resistant PVC.

2.2 SPLICE KITS

- A. Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.

1. Combination tape and cold-shrink-rubber sleeve kit with re-jacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
2. Heat-shrink splicing kit, polymeric construction with outer heat-shrink jacket.
3. Premolded, cold-shrink-rubber, in-line splicing kit.
4. Premolded EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.

2.3 SOLID TERMINATIONS

A. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.

1. Compound-filled, cast-metal body, metal-clad cable terminator for metal-clad cable with external plastic jacket.
2. Cold-shrink sheath seal kit with preformed sleeve openings sized for cable and insulated conductors.
3. Heat-shrink sheath seal kit with phase- and ground-conductor re-jacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.
4. Cast-epoxy-resin sheath seal kit with wraparound mold and packaged, two-part, epoxy-resin casting material.

B. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class is equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone rubber, insulator modules; shield ground strap; and compression-type connector.
2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.
4. Class 1 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.
5. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
6. Class 3 Terminations: Kit with stress cone and compression-type connector.

C. Nonshielded-Cable Terminations: Kit with compression-type connector. Include silicone-rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.

2.4 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

- B. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.
- C. Load-Break Cable Terminators: Elbow-type units with 200-A load make/break and continuous-current rating. Include test point on terminator body that is capacitance coupled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cables according to IEEE 576.
- B. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- D. Support cables according to Division 26 Section "Common Work Results for Electrical."
- E. Install direct-buried cables on leveled and tamped bed of 3-inch- (75-mm-) thick, clean sand. Separate cables crossing other cables or piping by a minimum of 4 inches (100 mm) of tamped earth.
 - 1. Install permanent markers at ends of cable runs, changes in direction, and buried splices.
 - 2. Install "buried-cable" warning tape 12 inches (305 mm) above cables.
- F. Install cable splices at pull points and elsewhere as indicated; use standard kits.
- G. Install separable insulated-connector components as follows:
 - 1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
 - 2. Portable Feed-Through Accessory: Three.
 - 3. Standoff Insulator: Three.
- H. Ground shields and metal bodies of shielded cable at terminations, splices, and separable insulated connectors.

3.2 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.

END OF SECTION

SECTION 16130

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

- A. Product Data:** For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings:** For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:** Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Seismic Qualification Certificates:** For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling:** Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC:** Comply with ANSI C80.1 and UL 6.

- C. ARC: Comply with ANSI C80.5 and UL 6A.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Continuous HDPE: Comply with UL 651B.

- F. Coilable HDPE: Preamsembled with conductors or cables, and complying with ASTM D 3485.
- G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Fittings for LFNC: Comply with UL 514B.
- I. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- J. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

- E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, [ferrous alloy] [aluminum], Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
 - 1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

- K. Gangable boxes are allowed.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: IMC.
 - 2. Concealed Conduit, Aboveground: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: IMC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

6. Damp or Wet Locations: IMC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10. Set Screws are not acceptable.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- G. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 5. Change from ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising above floor.
- H. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- N. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a

flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

- P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

- Q. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - d. Attics: 135 deg F (75 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

- R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

- S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

- T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- V. Locate boxes so that cover or plate will not span different building finishes.
- W. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- X. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:** List of legends and description of materials and process used for pre-marking wall plates.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:** Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
- B. Convenience Receptacles with Dual USB Charging Ports, 125V, 20A. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596. USB ports to supply 2.1A each, minimum. UL498 and UL1310

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

2.6 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

2.7 WALL SWITCH SENSOR – LINE VOLTAGE

- A. Sensors shall mount in a standard switch plate and shall mount recessed into a standard gang box.

- B. Sensor shall have a 180 degree coverage pattern.
- C. Provide an adjustable time out period of 30 seconds to 30 minutes.
- D. There shall be no leakage current to the load when the sensor is in the off position.
- E. Photocell feature shall be provided so that when occupancy is detected, the sensor will only allow the load to be switched on if the light level is below the level set by the user.
- F. A Manual override switch is to be provided on the sensor to allow the sensor to switch loads ON by the switch and OFF by the sensor.
- G. If required by the plans, provide a vacancy detector. This detector shall not be reconfigurable to be an occupancy sensor by the user.
- H. Where 2 level switching is required, provide optional 2 pole sensors. The sensors must be able to be set to activate alternating poles to provide even lamp wear.

2.8 WALL SWITCH SENSOR – LOW VOLTAGE

- A. Sensors shall mount in a standard switch plate and shall mount recessed into a standard gang box.
- B. Sensor shall have a 180 degree coverage pattern.
- C. Provide an adjustable time out period of 30 seconds to 30 minutes.
- D. Sensors shall operate with Power Pack using diode pulse technology.
- E. If required, multiple sensors may be linked together on a single Power Pack and be configured so that all sensors in a single space can act together as one zone.
- F. Photocell feature shall be provided so that when occupancy is detected, the sensor will only allow the load to be switched on if the light level is below the level set by the user.
- G. A Manual override switch is to be provided on the sensor to allow the sensor to switch loads ON by the switch and OFF by the sensor.
- H. Where 2 level switching is required, provide optional 2 pole sensors. The sensors must be able to be set to activate alternating poles to provide even lamp wear.
- I. Provide as required on the plans, options that are available from the following list:
 - 1. 0-10VDC outputs for dimming ballast option for daylight harvesting with user settable light levels
 - 2. Configurable high and low light level set points so that the sensor can toggle between light levels upon occupancy
 - 3. Auxiliary relay, for signaling other systems, which can be configured so that it synchronizes with the on/off status of the load or the status of occupancy/vacancy

2.9 CEILING SENSOR – LINE VOLTAGE

- A. Ceiling sensors shall mount recessed in to the ceiling space.
- B. Sensors shall have a 360 degree coverage pattern with an adjustable swivel head to maximize coverage area when mounted on sloped ceilings.
- C. Provide an adjustable time out period of 30 seconds to 30 minutes.
- D. Photocell feature shall be provided so that when occupancy is detected, the sensor will only allow the load to be switched on if the light level is below the level set by the user.
- E. A manual override switch is to be provided on the sensor to allow the load to be manually switched on and off for the purpose of testing during installation.
- F. Where 2 level switching is required, provide optional 2 pole sensors. The sensors must be able to be set to activate alternating poles to provide even lamp wear.

2.10 CEILING SENSOR – LOW VOLTAGE

- A. Ceiling sensors shall mount recessed in to the ceiling space.
- B. Sensors shall have a 360 degree coverage pattern with an adjustable swivel head to maximize coverage area when mounted on sloped ceilings.
- C. Provide an adjustable time out period of 30 seconds to 30 minutes.
- D. Sensors shall operate with Power Pack using diode pulse technology.
- E. Photocell feature shall be provided so that when occupancy is detected, the sensor will only allow the load to be switched on if the light level is below the level set by the user.
- F. A manual override switch is to be provided on the sensor to allow the load to be manually switched on and off for the purpose of testing during installation.
- G. Where 2 level switching is required, provide optional 2 pole sensors. The sensors must be able to be set to activate alternating poles to provide even lamp wear.
- H. Provide as required on the plans, options that are available from the following list:
 - 1. 0-10VDC outputs for dimming ballast option for daylight harvesting with user settable light levels
 - 2. Configurable high and low light level set points so that the sensor can toggle between light levels upon occupancy
 - 3. Auxiliary relay, for signaling other systems, which can be configured so that it synchronizes with the on/off status of the load or the status of occupancy/vacancy

2.11 WALL MOUNT SENSOR – LOW VOLTAGE

- A. Wall Mount Sensors shall connect to a mounting bracket designed to allow 45 degree movement in both the horizontal and vertical directions.
- B. Sensors shall have a 90 degree coverage area for corner mount applications and 130 degree coverage area for large area applications.
- C. Provide an adjustable time out period of 30 seconds to 30 minutes.
- D. Sensors shall operate with Power Pack using diode pulse technology.
- E. Photocell feature shall be provided so that when occupancy is detected, the sensor will only allow the load to be switched on if the light level is below the level set by the user.
- F. A manual override switch is to be provided on the sensor to allow the load to be manually switched on and off for the purpose of testing during installation.
- G. Where 2 level switching is required, provide optional 2 pole sensors. The sensors must be able to be set to activate alternating poles to provide even lamp wear.
- H. Provide as required on the plans, options that are available from the following list:
 - 1. 0-10VDC outputs for dimming ballast option for daylight harvesting with user settable light levels
 - 2. Configurable high and low light level set points so that the sensor can toggle between light levels upon occupancy
 - 3. Auxiliary relay, for signaling other systems, which can be configured so that it synchronizes with the on/off status of the load or the status of occupancy/vacancy

2.12 POWER PACKS

- A. Where indicated on the plans, provide Power Packs capable of powering multiple sensors. The Power Pack shall be controlled by a diode pulse provide by a switch or occupancy sensor.
- B. Power Packs shall provide up to a maximum of 150mA at 24VAC to the low voltage occupancy sensors.

2.13 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Stainless Steel
 - 3. Material for Unfinished Spaces: Stainless Steel.
 - 4. Material for offices and conference rooms: Ivory or as selected by architect.
 - 5. Material for Damp Locations: Stainless Steel with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant Stainless Steel with lockable cover.

2.14 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: Stainless Steel for public spaces. For office and conference rooms, Ivory or as selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red.
 - 3. TVSS Devices: Blue.
- B. Wall Plate Color: For plastic covers, match device color.

2.15 DISCONNECT SWITCHES

- A. General: Except as otherwise specified below or indicated on the drawings, Electrical Section shall provide disconnect switches, electrically operated equipment, regardless of who furnishes and/or installs that equipment. All devices provided by the electrical section shall be of the same manufacturer. Types and locations of these devices shall be as indicated, or as required where types and/or locations are not indicated.
 - 1. These devices which are located on other equipment shall be as specified under the corresponding headings; these devices NOT located on other equipment shall be as specified below, and shall be separately mounted.
 - 2. Separately mounted disconnect switches, circuit breakers, and motor starters Enclosure types shall be NEMA 3R for devices exposed to weather; NEC required type for devices in other special locations, and NEMA 1 type for devices in other locations. Each circuit breaker and each disconnect switch, including those integral with motor starters, shall have padlocking means.
- B. Disconnect Switches: These shall be heavy-duty type and shall be non-fused safety switches where overcurrent protection is not required; and fused safety switches or circuit breakers (as indicated) where overcurrent protection is required; except that other suitable properly rated switches may be used for fractional hp motors and other small loads.
- C. Devices Furnished by Other Sections or Others:
 - 1. Where disconnect switches for equipment and furnished with and factory mounted on the equipment; Electrical Section shall connect to the equipment and/or switches, as required.
 - 2. Starters and disconnect switches for mechanical equipment shall be furnished and installed and wired by the electrical section where indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 OCCUPANCY SENSORS

- A. Locate sensors so there are no objects blocking the infra red sensor from viewing all of the coverage area. Keep away from HVAC vents, direct sunlight and direct light from light fixtures.
- B. Adhere to manufacturer's recommendations for location, coverage area, wiring and programming.

3.4 POWER PACKS

- A. Mount Power Packs into a 4 inch junction box through a ½ inch conduit opening.

3.5 LOW VOLTAGE WIRING

- A. Low voltage wiring shall be single pair #18 LVT wire type or equivalent.

3.6 LINE VOLTAGE WIRING

- A. Pigtail leads from sensors are #14AWG. Use appropriately sized wire for the branch circuit.
- B. Make appropriate grounding connections to the Wall Switch sensors.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 16145

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor photoelectric switches.
 - 3. Indoor occupancy sensors.
 - 4. Outdoor motion sensors.
 - 5. Lighting contactors.
 - 6. Emergency shunt relay.
- B. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
 - 1. Contact Configuration: SPST.
 - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
 - 3. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 - 4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 - 5. Astronomic Time: All channels.
 - 6. Battery Backup: For schedules and time clock.

B. Electromechanical-Dial Time Switches: Type complying with UL 917.

1. Contact Configuration: SPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomic time dial.
5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 INDOOR OCCUPANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.
- B. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of sound and movement in area of coverage.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

2.4 OUTDOOR MOTION SENSORS (PIR)

- A. Performance Requirements: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F (minus 40 to plus 54 deg C), rated as raintight according to UL 773A.
1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outdoor junction box.
 - b. Relay: Internally mounted in a standard weatherproof electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 3. Bypass Switch: Override the on function in case of sensor failure.
 4. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc (11 to 215 lx); keep lighting off during daylight hours.
- B. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
- C. Detection Coverage: Up to 35 feet (11 m), with a field of view of 180 degrees.
- D. Lighting Fixture Mounted Sensor: Suitable for switching 300 W of tungsten load at 120- or 277-V ac.
- E. Individually Mounted Sensor: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

1. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
2. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

2.5 LIGHTING CONTACTORS

- A. Description: Electrically operated and electrically held, combination type with fusible switch, complying with NEMA ICS 2 and UL 508.
 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- B. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.
 1. Monitoring: On-off status.
 2. Control: On-off operation.

2.6 EMERGENCY SHUNT RELAY

- A. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual switching contacts; complying with UL 924.
 1. Coil Rating: 120 V.

2.7 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION

SECTION 16231

ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes trailer mounted, portable, packaged engine-generator sets for emergency power supply with the following features:
 - 1. Natural gas engine.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Outdoor enclosure.
- B. See Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 SUBMITTALS

- A. Product Data: For each type of packaged engine generator and accessory indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Source quality-control test reports.
- D. Field quality-control test reports.
- E. Operation and maintenance data.
- F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with ASME B15.1.
- D. Comply with NFPA 37.
- E. Comply with NFPA 70.
- F. Comply with NFPA 99.

- G. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- H. Comply with UL 2200.
- I. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- J. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.4 PROJECT CONDITIONS

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: Minus 15 to plus 40 deg C.
 - 2. Relative Humidity: 0 to 95 percent.
 - 3. Altitude: Sea level to 1000 feet (300 m).

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
- C. Capacities and Characteristics:
 - 1. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.
 - 2. Output Connections: Three-phase, four wire.
 - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.2 ENGINE

A. Fuel:

1. Natural gas.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Natural Gas:
 - a. Carburetor.
 - b. Secondary Gas Regulators: .
 - c. Fuel-Shutoff Solenoid Valves: .
 - d. Flexible Fuel Connectors: .

- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- G. Governor: Adjustable isochronous, with speed sensing.
- H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
 - 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 2. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
- I. Muffler/Silencer: Industrial type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - 1. Minimum sound attenuation of 12 dB at 500 Hz.
 - 2. Sound level measured at a distance of 23 feet (7 m) from exhaust discharge after installation is complete shall be 75 dBA or less.
- J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- K. Starting System: 24-V electric, with negative ground.
 - 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - 3. Cranking Cycle: 15 seconds.
 - 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least twice without recharging.
 - 5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
 - a. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236.

2.3 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
- D. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 2 system, and the following:
 - 1. AC voltmeter.
 - 2. AC ammeter.
 - 3. AC frequency meter.
 - 4. DC voltmeter (alternator battery charging).
 - 5. Engine-coolant temperature gage.
 - 6. Engine lubricating-oil pressure gage.
 - 7. Running-time meter.
 - 8. Ammeter-voltmeter, phase-selector switch(es).
 - 9. Generator-voltage adjusting rheostat.
 - 10. Generator overload.
- E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.4 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.
 - 1. Tripping Characteristic: Designed specifically for generator protection.
 - 2. Trip Rating: Matched to generator rating.
 - 3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
 - 4. Mounting: Adjacent to or integrated with control and monitoring panel.
- B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.5 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.

- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Dripproof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
 - 1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 20 percent, maximum.

2.6 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
 - 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
 - 2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
- C. Interior Lights with Switch: Factory-wired, vaporproof-type fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.
 - 1. AC lighting system and connection point for operation when remote source is available.
 - 2. DC lighting system for operation when remote source and generator are both unavailable.
- D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.7 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
- B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.9 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.
 - 2. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Install packaged engine generator with elastomeric isolator.
- D. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet. Flexible

connectors and steel piping materials and installation requirements are specified in Division 23 Section "Hydronic Piping."

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints. Flexible connectors and piping materials and installation requirements are specified in Division 23 Section "Hydronic Piping."
- E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
- F. Piping installation requirements are specified in Division 23 Sections. Drawings indicate general arrangement of piping and specialties.
- G. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- H. Connect engine exhaust pipe to engine with flexible connector.
- I. Connect fuel piping to engines with a gate valve and union and flexible connector.
- J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- L. Identify system components according to Division 23 Section "Identification for HVAC Piping and Equipment" and Division 26 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.

- b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 - 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 - 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 - 6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
 - 7. Exhaust Emissions Test: Comply with applicable government test criteria.
 - 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 - 9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
 - 10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at a location 23 feet away, and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
 - D. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - E. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - G. Remove and replace malfunctioning units and retest as specified above.
 - H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - I. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Receptacle switches.
 - 2. Molded-case circuit breakers (MCCBs).
 - 3. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 RECEPTACLE SWITCHES

- A. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 240-V ac, 30 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- B. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 240-V ac, 30 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- D. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I^2t response.

- D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- E. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - 7. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 16074 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Section 16075 "Electrical Identification."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 16415

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes automatic transfer switches rated 600 V and less.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based.
- D. Field quality-control test reports.
- E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 70.
- D. Comply with NFPA 99.
- E. Comply with NFPA 110.

- F. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
- C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
 - 2. Switch Action: Double throw; mechanically held in both directions.
 - 3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
- G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.
- H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.
- J. Battery Charger: For generator starting batteries.
 - 1. Float type rated 2 A.

2. Ammeter to display charging current.
 3. Fused ac inputs and dc outputs.
- K. Enclosures: General-purpose NEMA 250, Type 3, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- D. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.
- E. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase.
- F. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated.
- G. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer.
- H. Automatic Transfer-Switch Features:
 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 5. Test Switch: Simulate normal-source failure.
 6. Switch-Position Pilot Lights: Indicate source to which load is connected.
 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

- a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
- 9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
- 11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
- 12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
- 13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.

2.3 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details.
- B. Floor-Mounting Switch: Anchor to floor by bolting.
 - 1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for

seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
 - 2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 - 5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
 - f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
 - 6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
 - a. Verify grounding connections and locations and ratings of sensors.
- C. Coordinate tests with tests of generator and run them concurrently.

- D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training."
- B. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

- 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Field quality-control reports.
- C. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Main and Neutral Lugs: Compression type.
 3. Ground Lugs and Bus Configured Terminators: Compression type.
 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, power and feeder distribution type.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- F. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Mains: Circuit breaker.
- C. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- D. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
1. External Control-Power Source: 120-V branch circuit.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Communication Capability: Din-rail-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at [55] [75] percent of rated voltage.
 - g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 16511

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.
- B. Shop Drawings:** Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. **Product Certificates:** For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.**

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures:** Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts:** Free of burrs and sharp corners and edges.
- C. Sheet Metal Components:** Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access:** Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools.

Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
 - b. UV stabilized.
2. Glass: Annealed crystal glass unless otherwise indicated.

2.2 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
 2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2.3 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 1. Separate circuit with single lighting inverter.
 2. Battery: Sealed, maintenance-free, lead-acid type.
 3. Charger: Fully automatic, solid-state type with sealed transfer relay.
 4. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 7. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 8. Integral Time-Delay Relay: Holds unit on for fixed interval of [15] <Insert period> minutes when power is restored after an outage.

2.4 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- E. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable lighting fixtures to provide required light intensities.
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.

1.2 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of 500 lbf (2224 N), distributed as stated in AASHTO LTS-4-M.
- C. Ice Load: Load of 3 lbf/sq. ft. (145 Pa), applied as stated in AASHTO LTS-4-M Ice Load Map.
- D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
 1. Basic wind speed for calculating wind load for poles 50 feet (15 m) high or less is 100 mph (45 m/s).
 - a. Wind Importance Factor: 1.0.
 - b. Minimum Design Life: 25 years.
 - c. Velocity Conversion Factors: 1.0.

1.3 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."

- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.
- N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: Dark bronze.
- O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp and ballast characteristics:
 - a. "USES ONLY" and include specific lamp type.
 - b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.
 - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
 - d. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.
 - e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
 - f. CCT and CRI for all luminaires.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
 - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
 - 2. Adjustable window slide for adjusting on-off set points.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Division 16 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

END OF SECTION