

THE NATIONAL WWII MUSEUM

FLOYD EDUCATION & COLLECTIONS PAVILION

1060 Magazine Street
New Orleans, LA 70130

PROJECT MANUAL
MBA PROJECT NO. 12274



August 4, 2025

MATHES BRIERRE ARCHITECTS

201 St. Charles Avenue, Suite 4100
New Orleans, Louisiana 70170-4100
TEL: 504.586.9303

TABLE OF CONTENTS

BIDDING DOCUMENTS

SECTION 00020	ADVERTISEMENT FOR BIDS
SECTION 00100	INSTRUCTIONS TO BIDDERS
	LOUISIANA UNIFORM PUBLIC WORK BID FORM
SECTION 00450	NONCOLLUSION AFFADAVIT
	ATTESTATION CLAUSE (LA R.S. 38§2227)
	VERIFICATION OF EMPLOYEES (LA R.S. 38§2212.10)

CONTRACTUAL DOCUMENTS

SECTION 00500	CONTRACT AGREEMENT FORMS AND BONDS
	<i>AIA A101- 2017 Edition Form of Agreement between Owner and Contractor</i>
SECTION 00700	GENERAL CONDITIONS
	<i>AIA A201-2007 The General Conditions of the Contract for Construction</i>
SECTION 00800	SUPPLEMENTARY CONDITIONS
	<i>Contractor Release and Waiver</i>
	<i>Subcontractor Release and Waiver</i>

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010	SUMMARY OF WORK
	<i>Request for Information form</i>
SECTION 01030	ALTERNATES
SECTION 01040	CUTTING AND PATCHING
SECTION 01200	PROJECT MEETINGS
SECTION 01290	PAYMENT PROCEDURES
SECTION 01300	SUBMITTALS
	<i>“Round-Robin” Transmittal form</i>
SECTION 01400	PROCEDURES AND QUALITY CONTROL
SECTION 01410	TESTING LABORATORY SERVICES
SECTION 01500	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
SECTION 01600	MATERIALS AND EQUIPMENT
SECTION 01700	PROJECT CLOSEOUT

DIVISION 2 - SITEWORK

SECTION 02005	SOIL INVESTIGATION DATA
	<i>Geotech report (Eustis Engineering Services dated October 22, 2013)</i>
SECTION 02070	SELECTIVE DEMOLITION
SECTION 02200	EXCAVATING, FILLING AND GRADING
SECTION 02281	SOIL TREATMENT FOR TERMITE CONTROL
SECTION 02300	EARTHWORK
SECTION 02350	AUGER CAST-IN-PLACE PILES
SECTION 02500	BRICK PAVING
SECTION 02510	WATER DISTRIBUTION
SECTION 02530	SANITARY SEWERAGE
SECTION 02630	STORM DRAINAGE
SECTION 02740	FLEXIBLE PAVEMENT

SECTION 02750	RIGID PAVEMENT
SECTION 02871	BIKE RACKS
SECTION 02900	LANDSCAPE WORK

DIVISION 3 - CONCRETE

SECTION 03300	CAST-IN-PLACE CONCRETE -
SECTION 03350	CONCRETE FLOORS - SEALED

DIVISION 4 - MASONRY

SECTION 04100	MORTAR
SECTION 04200	UNIT MASONRY WORK

DIVISION 5 - METALS

SECTION 05120	STRUCTURAL STEEL
SECTION 05210	STEEL JOISTS
SECTION 05300	STEEL DECKING
SECTION 05400	COLD FORMED METAL FRAMING
SECTION 05410	COLD FORMED STEEL TRUSSES
SECTION 05500	METAL FABRICATIONS
SECTION 05510	METAL STAIRS
SECTION 05700	ORNAMENTAL METAL FABRICATIONS
SECTION 05730	STAINLESS STEEL RAILING SYSTEM
SECTION 05731	GLASS RAILING SYSTEM
SECTION 05800	EXPANSION CONTROL

DIVISION 6 - CARPENTRY

SECTION 06100	CARPENTRY
SECTION 06410	ARCHITECTURAL WOODWORK
SECTION 06614	QUARTZ SURFACES

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07130	LIQUID APPLIED VAPOR/AIR BARRIER MEMBRANE -
SECTION 07145	CRYSTALLINE WATERPROOFING <i>Grout tube Data Sheet</i>
SECTION 07210	BUILDING INSULATION
SECTION 07270	FIRESTOPPING
SECTION 07400	METAL WALL PANELS
SECTION 07500	MODIFIED BITUMEN ROOFING
SECTION 07620	FLASHING AND SHEETMETAL
SECTION 07800	ROOF ACCESSORIES
	<i>Pipe Cowl detail</i>
SECTION 07900	JOINT SEALERS

DIVISION 8 - DOORS AND WINDOWS

SECTION 08112	STEEL DOORS AND FRAMES
SECTION 08200	WOOD DOORS
SECTION 08305	ACCESS DOORS
SECTION 08360	OVERHEAD DOORS
SECTION 08410	INTERIOR ALUMINUM ENTRANCES AND STOREFRONTS
SECTION 08412	EXTERIOR FIRE RATED CURTAINWALL SYSTEMS
SECTION 08415	INTERIOR FIRE RATED STOREFRONT SYSTEMS
SECTION 08710	DOOR HARDWARE
SECTION 08800	GLASS AND GLAZING
SECTION 08900	ALUMINUM CURTAINWALL AND ENTRANCES

DIVISION 9 - FINISHES

SECTION 09221	PLASTER SOFFITS
SECTION 09260	GYPSUM BOARD SYSTEMS
SECTION 09265	DRYWALL SHAFT SYSTEMS
SECTION 09290	EXTERIOR SHEATHING
SECTION 09300	TILE WORK
SECTION 09400	EPOXY TERRAZZO FLOORING
SECTION 09511	SUSPENDED ACOUSTICAL CEILINGS
SECTION 09512	SUSPENDED METAL GRATE CEILINGS
SECTION 09521	TECTUM ACOUSTICAL PANELS (DIRECT ATTACHMENT)
SECTION 09525	ACOUSTICAL BOARDS
SECTION 09650	RESILIENT BASE
SECTION 09670	RESINOUS FLOORING SYSTEM
SECTION 09688	CARPET
SECTION 09800	ELASTOMERIC COATINGS
SECTION 09900	PAINTING

DIVISION 10 - SPECIALTIES

SECTION 10260	STAINLESS STEEL CORNER GUARDS
SECTION 10400	INTERIOR SIGNS
SECTION 10500	METAL LOCKERS
SECTION 10522	FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES
SECTION 10800	TOILET ACCESSORIES

DIVISION 11

SECTION 11100	VLM UNITS
SECTION 11450	KITCHEN APPLIANCES

DIVISION 12 - FURNISHINGS

NOT USED

DIVISION 13

NOT USED

DIVISION 14 - CONVEYING DEVICES

SECTION 14215 ELECTRIC ELEVATORS

DIVISION 15 – MECHANICAL

SECTION 15050	BASIC MATERIALS AND METHODS
SECTION 15250	PIPING AND EQUIPMENT INSUALTION
SECTION 15400	PLUMBING
SECTION 15500	FIRE SUPPRESSION SYSTEM
SECTION 15550	CLEAN AGENT SUPPRESSIONS SYSTEM
SECTION 15800	HEATING, VENTILATTION AND AIR CONDITIONING
SECTION 15850	TESTING, ADJUSTING AND BALANCING OF AIR SYSTEMS
SECTION 15900	VALVES, STRAINERS, UNIONS AND FITTINGS

DIVISION 16 - ELECTRICAL

SECTION 16010	ELECTRICAL GENERAL REQUIREMENTS
SECTION 16020	ELECTRICAL DEMOLITION
SECTION 16060	GROUNDING AND BONDING
SECTION 16073	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
SECTION 16075	ELECTRICAL IDENTIFICATION
SECTION 16100	OVERCURRENT PROTECTIVE DEVICE COORDINATION
SECTION 16120	CONDUCTORS AND CABLES
SECTION 16130	RACEWAYS AND BOXES
SECTION 16140	WIRING DEVICES
SECTION 16145	LIGHTING CONTROL DEVICES
SECTION 16231	ENGINE GENERATORS
SECTION 16410	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
SECTION 16413	ELECTRICITY METERING
SECTION 16415	TRANSFER SWITCHES
SECTION 16440	SURGE PROTECTION DEVICE
SECTION 16442	PANELBOARDS
SECTION 16491	FUSES
SECTION 16511	LIGHTING
SECTION 16700	TELECOMMUNICATIONS
SECTION 16721	FIRE ALARM SYSTEM
SECTION 16723	INTRUSION DETECTION
SECTION 16750	VIDEO SURVEILLANCE
SECTION 16777	ACCESS CONTROLS

END OF TABLE OF CONTENTS

ADVERTISEMENT FOR BIDS

SECTION 00020

Project: **THE NATIONAL WORLD WAR II MUSEUM
FLOYD EDUCATION & COLLECTIONS PAVILION
1060 MAGAZINE STREET
NEW ORLEANS, LA 70130
MBA Project No. 12274**

BID DATE AND TIME: No later than **2:00 p.m. on September 16, 2025**. Bids received after this time or missing Contractor's license number on the outside of the bid envelope will not be accepted.

PROPOSALS:

Sealed proposals will be received in the Favrot Orientation Center located on the first floor of the Louisiana Memorial Pavilion at The National World War II Museum located at 945 Magazine Street, New Orleans, Louisiana for furnishing all labor, materials, and equipment to complete the above-mentioned project in accordance with the Contract Documents.

Only Contractors, subcontractors and sub-subcontractors licensed by the State of Louisiana (RS: 2150-2163) for (1) Building Construction at the time of document requisition by them, can obtain bid documents and bid on this project. The license number must be given to the Architect at the time documents are to be distributed. Bids shall be accepted from Contractors who are licensed under LA. R.S. 37:2150-2163 for the classification of (1) Building Construction. Bidder is required to comply with provisions and requirements of LA R.S.38:2212 (A)(1)(c). No bid may be withdrawn for a period of forty-five (45) days after receipt of bids, except under the provisions of LA. R.S. 38:2214.

The bids will be opened publicly and read aloud upon opening bids in accordance with La R.S. 38:2212 (A) (3) (a) at the place and time designated herein. Contractor to indicate the License Number on the envelope

Non-Mandatory Pre-Bid Meeting: There will be a pre-bid meeting held at **10:00 a.m. on August 25, 2025** at the Favrot Orientation Center followed by a site tour of the 1060 Magazine St. building. Attendance is strongly recommended, but not mandatory.

BID SECURITY:

All bids must be accompanied by bid security equal to five percent (5%) of the sum of the base bid and all alternates, and must be in the form of a certified check, cashier's check or an acceptable Bid Bond. If bid bond is used, it shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, **or** by a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide to write individual bonds up to ten percent of policyholders' surplus as shown in the A.M. Best's Key Rating Guide **or** by an insurance company in good standing licensed to write bid bonds which is either domiciled in Louisiana or owned by Louisiana residents. The Bid Bond shall be in favor of the Owner and shall be accompanied by appropriate power of attorney. No Bid Bond indicating an obligation of less than five percent (5%) by any method is acceptable.

NON-DISCRIMINATION:

Contractors for work under this Bid will obligate the Contractor and subcontractors not to discriminate in employment practices

OBTAINING DRAWINGS AND PROJECT MANUALS:

Bidding documents are available for download at the Architects FTP site at no fee. Contact Tommy Grey at Tgrey@mathesbrierre.com for instructions to access the documents on the FTP site. Bidders requesting documents must submit with their request their license number and also e-mail address for receiving addenda. Printed copies are not available from the Architect, but arrangements can be made to obtain them through most reprographic firms. Plan holders are responsible for their own reproduction costs.

.

END OF SECTION

INSTRUCTIONS TO BIDDERS**SECTION 00100****COMPLETION TIME**

The Bidder shall agree to fully complete the total contract within **420 consecutive calendar days**, subject to such extensions as may be granted under in the General Conditions and the Supplementary Conditions, and acknowledges that this construction time will start on or before the date specified in the written “Notice to Proceed” from the Owner.

Additionally, if any alternates are accepted, add the following number of consecutive calendar days to the contract time.

Alternate No.1: add 0 consecutive calendar days to the contract time.

POST BID INFORMATION

The Non-collusion Affidavit, Attestation Clause (LA R.S. 38:2227) and Verification of Employees (LA R.S. 38:2212.10) shall be submitted by low bidder within ten days of the date of the bid opening. These forms are not to be submitted with bid.

QUALIFICATIONS OF BIDDERS

Only the bids of Contractors licensed under R.S. 37:2150 et seq of the Louisiana State Legislature will be considered. The Bidder shall certify that he is licensed under R.S. 37:2150 et seq, and show his license number on the Form of Proposal above his signature. The Bidder must currently be licensed in the State of Louisiana with a classification of “Building Construction”

EXAMINATION OF BIDDING DOCUMENTS

Each bidder shall examine the bidding documents and site carefully and shall, not later than seven (7) working days prior to the date of receipt of bids, make written request to the Architect for interpretation or correction of any ambiguity, inconsistency or error therein which he may discover. Any interpretation or correction will be issued as an addendum by the Architect. Only interpretation or correction by addendum shall be binding. No Bidder shall rely upon any interpretation or correction given by any other method.

Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.

Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect, to reach him at least seven days prior to the date for receipt of bids.

Any interpretation, correction or change of the Bidding Documents will be made by addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

SUBSTITUTIONS

The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. Prior approval requests will be addressed so all bidders have the same advantage of approved products, and architect will also review substitution requests after the bid. This project is under State public bid law

No substitution will be considered unless written request for approval has been submitted by the Proposer and has been received by the Architect at least seven (7) working days prior to the date for receipt of bids. (RS38:2295C) Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the proposer to include in his proposal all changes required of the Contract Documents if the proposed product is used. Prior approval is given contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.

ADDENDA

Prior to receipt of bids, addenda will be forwarded to each person or firm recorded by the Architect as having received the bidding documents and will be available for inspection wherever the bidding documents are kept available for that purpose. Addenda will be delivered to all prime bidders who have requested bid documents within twenty-four hours of issuance by fax, e-mail or other electronic means or by hand and a copy will be mailed to all prime bidders who have requested bid documents in accordance with La R.S 38:2212 (C) (2) (a) (b).

Failure of a Bidder to receive any addendum shall not release the Bidder from any obligations under this bid, provided said addendum was sent by e-mail, telegram, or by U.S. Mail to the address furnished by the Bidder for transmittal by mail. Bidder shall further acknowledge receipt of all Addendum in the Form of Proposal and if not so indicated, the proposal will be rejected. Contractor is responsible to verify receipt of all addenda issued.

If an addendum is issued within a period of seventy-two (72) hours prior to the advertised time for the opening of bids, excluding Saturdays, Sundays, and any other legal holidays, the bid date will be extended at least seven (7) days and the addenda will state the revised date and time for the opening of bids, La R.S 38:2212 (C) (2) (b).

DEFINITIONS

Definitions set forth in the "General Conditions" apply to the Bidding Documents, which include the "Advertisement for Bid", the "Instructions to Bidders", the "Form of Proposal" and the proposed "Contract Documents".

Addenda are written or graphic instruments issued prior to the execution of the Contract, which modify or interpret the bidding documents, including Drawings and Project Manual, by additions, deletions, clarifications, or corrections. Addenda will become part of the contract documents upon execution of the agreement.

PREPARATION OF BID FORM

Bids must be made out in writing and in figures using the unaltered Form of Proposal furnished by the Architect. Any other Form of Proposal or deviation furnished may render the bid informal and cause its rejection. The Bidder shall complete all blank spaces on his proposal form. Each bid must be placed in a sealed envelope addressed to the Owner.

Bid sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

On any bid in excess of fifty thousand dollars (\$50,000.00), the Contractor shall certify that he is licensed under R.S. 37: 2150-2173 and show his license number on the bid above his signature or his duly authorized representative. Plainly mark on the outside of the envelope the bidder's name, bidder's license number, and the address of the Bidder and the name of the contents. Any aforementioned information not contained on the envelope will cause the bid to be rejected and will be returned to the bidder

All bids must be submitted with a **corporate resolution or written evidence** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5). A Secretary's Certificate may not serve as written evidence of the authority of a person signing the bid because it potentially allows that individual to further delegate the authority to sign to another individual as included in the definition.

BID SECURITY

No bid shall be considered or accepted unless the bid is accompanied by bid security in an amount of not less than five percent (5%) of the Entire Bid Amount, including alternates. The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a Bid Bond written by a surety company licensed to do business in Louisiana and signed by the surety's agent or attorney-in-fact. Bid security shall be made out to the Owner identified below.

The National World War II Museum, Inc.
945 Magazine Street
New Orleans, La 70130

Bid security furnished by the Contractor shall guarantee that the Contractor will, if awarded the work according to the terms of his proposal, enter into the Contract and furnish Performance and Payment Bonds as required by these Contract Documents, within ten (10) days after written notice that the instrument is ready for his signature. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as penalty.

The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds have been furnished, or (b) the specified time has elapsed so that bids may be withdrawn, or (c) all bids have been rejected but not later than 45 days from the date of receipt of bids.

PERFORMANCE AND PAYMENT BONDS

See Section 00800-Supplementary Conditions and Agreement Supplements for requirements for the Contractor to provide the performance and payment bonds.

SUBMISSION OF BID

Sealed proposals will be received by the Owner at the time, date and place stated in the "Advertisement for Bids".

Plainly mark on the outside of the envelope the name, Contractor's license number, and the address of the Bidder and the name of the contents. No bid may be withdrawn for a period of forty five (45) days after receipt of bids with the ability to extend that time by one or more extensions of 30 days if the extensions are mutually agreed to by both parties in writing. In accordance with L.A. R.S. 38::2212.10, the contractor may withdraw a bid by affidavit within 48 hours of the bid opening for patently obvious, unintentional and substantial mechanical, clerical or mathematical errors.

General Contractors submitting a bid must complete the Bid Form and attach the executed Bid Security Form and Corporate Resolution in order to constitute a complete Bid Proposal. Include the Bidder's state contractor's license number on the envelope. The Non-collusion Affidavit, Attestation Clause (LA R.S. 38:2227) and Verification of Employees (LA R.S. 38:2212.10) shall be submitted by low bidder when low bidder is identified.

BIDDERS REPRESENTATIONS

Each Contractor in submitting his bid represents that he has read and understood the Contract Documents and has visited the site and determined for himself all existing conditions visually discernible and/or reasonably inferable from the Contract Documents or his particular knowledge of this particular type of project and has familiarized himself with the local conditions under which the work is to be performed; and he shall be responsible for same.

He shall also determine which laws and/or regulations will affect the prosecution of the Work and for which he will be responsible. His failure to do so shall not relieve him of the responsibility of carrying out the work outlined on the drawings or mentioned in the specifications.

He has compared the site with the Contract Documents and satisfied himself of the conditions of the site access, and all other matters that may be incidental to the work, before submitting his proposal. No allowance will subsequently be made to the successful Bidder by reason of any error or omission on his part due to his neglect in complying with the requirements of this article.

REJECTION OF BIDS

The Owner reserves the right to reject any and all bids as permitted by public bid laws; and to award the contract on the lump sum base bid and selected alternates. Award of alternates shall be made in accordance with La R.S. 38:2212 (A)(3)(e). Alternates, if accepted, shall be accepted in the order they are listed on the bid form. Determination of the low bidder shall be determined on the basis of the base bid and any alternates accepted. However, the Owner may accept alternates in any order which does not affect determination of the low bidder.

AWARD OF CONTRACT

The contract will be awarded to the lowest responsible bidder meeting the qualifications set forth in the bid documents and in compliance with La, R.S. 38:2212 (J).

Alternates may be accepted in any order as long it does not affect the determination of the low bidder per LA R.S. 38:2212.J.

Per LA R.S. 38§2215.A “A public entity shall act not later than forty-five calendar days after the date of opening bids to award such public works contract to the lowest responsible and responsive bidder or to reject all bids. However, the public entity and the lowest responsible and responsive bidder, by mutually written consent, may agree to extend the deadline for award by one or more extensions of thirty calendar days.”

PREBID CONFERENCE

There will be a pre-bid conference for all bidders as indicated in the Advertisement for Bids, with attendance strongly recommended but not mandatory.

SUBCONTRACTORS

If requested by the Owner, the bidder shall submit the list of proposed subcontractors no later than one week after the bid.

END OF SECTION

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: The National World War II Museum
945 Magazine Street
New Orleans, Louisiana 70130

BID FOR: THE NATIONAL WORLD
WAR II MUSEUM
FLOYD EDUCATION
& COLLECTIONS PAVILION
1060 MAGAZINE STREET
NEW ORLEANS, LA 70130

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: Mathes Brierre Architects and dated: August 4, 2025.

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____ .

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars (\$ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 Added cost to furnish and install one (1) VLM unit as specified in Section 11100-VLM Units and as indicated on the drawings for the lump sum of: (See Section 01030-Alternates for additional information on this alternate.)

_____ Dollars (\$ _____)

Alternate No. 2 Added cost to furnish and install track heads type TA and TC for ceiling tracks T1A and T1B in the Macro Exhibit areas for the lump sum of: (See Section 01030-Alternates for base bid and additional information on this alternate.)

_____ Dollars (\$ _____)

Alternate No. 3 Added cost to furnish and install terrazzo flooring as shown on the drawings in lieu of base bid resinous flooring for the lump sum of: (See Section 01030-Alternates for additional information on this alternate.)

_____ Dollars (\$ _____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC WORK BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

**** A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38:2218.A is attached to and made a part of this bid.

SECTION 00450

NONCOLLUSION AFFIDAVIT

STATE OF LOUISIANA

PARISH OF ORLEANS

_____, Being first duly sworn, deposes and says that:

1. He is (Owner) (Partner) (Officer) (Representative) or (Agent), of _____
_____ the Bidder that has submitted the attached Bid;
2. Such Bid is genuine and is not a collusive or sham Bid;
3. Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties of interest, including this affiant has in any way colluded, conspired, connived or agreed, directly, or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with such Contract, or has in any manner, directly or indirectly sought by agreement or collusion or communication or conference with any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other bidder, or to secure through any advantage against the Museum or any person interested in the proposed contract; and
4. The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

Subscribed and sworn to, this _____ day of _____ 202_____.

END OF SECTION 00450

Name of Project

Project No.

STATE OF

PARISH OF

ATTESTATIONS AFFIDAVIT

Before me, the undersigned notary public, duly commissioned and qualified in and for the parish and state aforesaid, personally came and appeared Affiant, who after being duly sworn, attested as follows:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)

(c) Extortion (R.S. 14:66)

(b) Corrupt influencing (R.S. 14:120)

(d) Money laundering (R.S. 14:230)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)

(f) Bank fraud (R.S. 14:71.1)

(b) Identity Theft (R.S. 14:67.16)

(g) Forgery (R.S. 14:72)

(c) Theft of a business record
(R.S. 14:67.20)

(h) Contractors; misapplication of
payments (R.S. 14:202)

(d) False accounting (R.S. 14:70)

(i) Malfeasance in office (R.S. 14:134)

(e) Issuing worthless checks
(R.S. 14:71)

LA. R.S. 38:2212.10 Verification of Employees

- A. At the time of bidding, Appearer is registered and participates in a status verification system to verify that all new hires in the state of Louisiana are legal citizens of the United States or are legal aliens.
- B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.
- C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

Name of Project

Project No.**LA. R.S. 23:1726(B) Certification Regarding Unpaid Workers Compensation Insurance**

- A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.
- B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding / proposing entity.

NAME OF BIDDER

NAME OF AUTHORIZED SIGNATORY OF BIDDER

DATE

TITLE OF AUTHORIZED SIGNATORY OF BIDDER

**SIGNATURE OF AUTHORIZED
SIGNATORY OF BIDDER/AFFIANT**

Sworn to and subscribed before me by Affiant on the ____ day of _____, 20__.

Notary Public

CONTRACT AGREEMENT FORMS AND BONDS

SECTION 00500

CONTRACT AGREEMENT FORM:

The "Standard Form of Agreement Between Owner and Contractor, payment basis is Stipulated Sum", Form No. A101, 2017 Edition as published by the American Institute of Architects where the basis of payment if a Stipulated Sum will be used, copy following this section.

Note that whenever "AIA Document A201™–2017, General Conditions of the Contract for Construction" is referenced in A101, 2017 Edition, it will be replaced with "AIA Document A201™–2007, General Conditions of the Contract for Construction"

PERFORMANCE AND PAYMENT BONDS:

Prior to the Owner signing the Contract agreement, he will require the Contractor to furnish Performance and Payment Bonds covering the faithful performance of the Construction Contract Agreement. The Performance Bond and the Payment Bond shall each be made out in one hundred percent (100%) of the Contract amount. The Performance and Payment Bond shall be issued by a company approved by the Owner.

The Performance and Payment Bond Form shall be as bound herein. The bond shall be signed by an official of the bonding company and shall be accompanied by the bonding agent's written power of attorney in order that one copy of each may be attached to each copy of the Contract Agreement.

The Contractor shall include in his proposal amount the total premiums for the performance and payment bonds.

INSURANCE REQUIREMENT:

Refer to the "Supplementary Conditions" for description of the required insurance certificates. Provide five (5) copies each of insurance certificates in order that one copy may be attached to each copy of the Contract Agreement.

END OF SECTION

DRAFT AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

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

« »
« »
« »
« »

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

« »
« »
« »
« »

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

« »
« »
« »

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

« »
« »
« »
« »

The Owner and Contractor agree as follows.

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

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

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

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

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- ☐ The date of this Agreement.
- ☐ A date set forth in a notice to proceed issued by the Owner.
- ☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

☐

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

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

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

[« »] By the following date: « »

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

Portion of Work

Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item

Price

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

Item

Price

Conditions for Acceptance

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

Item

Price

§ 4.4 Unit prices, if any:

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

Item

Units and Limitations

Price per Unit (\$0.00)

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:

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

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

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

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

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

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

« »

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

« »

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

« »

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

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

§ 5.2 Final Payment

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

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

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

« »

§ 5.3 Interest

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

(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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

« »

« »

« »

« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other (Specify)

☐

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

☐

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

☐

☐

☐

☐

☐

☐

§ 8.3 The Contractor’s representative:

(Name, address, email address, and other information)

☐

☐

☐

☐

☐

☐

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

§ 8.5 Insurance and Bonds

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

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

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

- .5 Drawings

Number	Title	Date

- .6 Specifications

Section	Title	Date	Pages

- .7 Addenda, if any:

Number	Date	Pages

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

- .8 Other Exhibits:

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

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

<< >>

[<< >>] The Sustainability Plan:

Title	Date	Pages

[<< >>] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

<< >>

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

OWNER (Signature)

<< >><< >>

(Printed name and title)

CONTRACTOR (Signature)

<< >><< >>

(Printed name and title)

GENERAL CONDITIONS

SECTION 00700

GENERAL CONDITIONS:

The 2007 Edition of "The General Conditions of the Contract for Construction", AIA Document A201, as published by the American Institute of Architects, as amended is hereby made a part of these specifications. Copy of A201 follows this section.

.

SUPPLEMENTARY CONDITIONS:

Certain articles of the AIA "General Conditions" are revised or superseded by requirements in the following "Supplementary Conditions". Such changes shall take precedence over the AIA "General Conditions".

END OF SECTION

DRAFT AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

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

test

THE OWNER:
(Name and address)

THE ARCHITECT:
(Name and address)

TABLE OF ARTICLES

1	GENERAL PROVISIONS
2	OWNER
3	CONTRACTOR
4	ARCHITECT
5	SUBCONTRACTORS
6	CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7	CHANGES IN THE WORK
8	TIME
9	PAYMENTS AND COMPLETION
10	PROTECTION OF PERSONS AND PROPERTY
11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS
14	TERMINATION OR SUSPENSION OF THE CONTRACT
15	CLAIMS AND DISPUTES

ADDITIONS AND DELETIONS:

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

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

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

INDEX

(Numbers and Topics in Bold are Section Headings)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, **12.1**

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,
10.2.8, 13.4.2, 13.7.1, 14.1, 15.2

Addenda

1.1.1, 3.11.1

Additional Costs, Claims for

3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.5**

Additional Insured

11.1.4

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8, 7.3.8

All-risk Insurance

11.3.1, 11.3.1.1

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7.1, 9.10,
11.1.3

Approvals

2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10,
4.2.7, 9.3.2, 13.5.1

Arbitration

8.3.1, 11.3.10, 13.1.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3.1, 7.1.2, 7.3.7, 7.4,
9.2.1, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1,
12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1

Architect, Limitations of Authority and
Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,
4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4.1,
9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2

Architect's Additional Services and Expenses

2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.4.1, 3.1.3, 3.5.1, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5.1, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14,
6.3.1, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4.1, 9.5, 9.8.4,
9.9.1, 13.5.2, 15.2, 15.3

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1,
3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18,
4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5,
15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1, 5.2.1, 11.4.1

Binding Dispute Resolution

9.7.1, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1,
15.3.2, 15.4.1

Boiler and Machinery Insurance

11.3.2

Bonds, Lien

7.3.7.4, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3

Certificates of Inspection, Testing or Approval
13.5.4

Certificates of Insurance

9.10.2, 11.1.3

Change Orders

1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3

Change Orders, Definition of

7.2.1

CHANGES IN THE WORK

2.2.1, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 7.4.1, 8.3.1, 9.3.1.1, 11.3.9

Claims, Definition of

15.1.1

CLAIMS AND DISPUTES

3.2.4, 6.1.1, 6.3.1, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4

Claims and Timely Assertion of Claims

15.4.1

Claims for Additional Cost

3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, **15.1.4**

Claims for Additional Time

3.2.4, 3.7.4.6.1.1, 8.3.2, 10.3.2, **15.1.5**

Concealed or Unknown Conditions, Claims for **3.7.4**

Claims for Damages

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Claims Subject to Arbitration

15.3.1, 15.4.1

Cleaning Up

3.15, 6.3

Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4

Commencement of the Work, Definition of **8.1.2**

Communications Facilitating Contract Administration

3.9.1, **4.2.4**

Completion, Conditions Relating to

3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2

COMPLETION, PAYMENTS AND

9

Completion, Substantial

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

Compliance with Laws

1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions

3.7.4, 4.2.8, 8.3.1, 10.3

Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2

Consolidation or Joinder

15.4.4

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

1.1.4, **6**

Construction Change Directive, Definition of
7.3.1

Construction Change Directives

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1

Construction Schedules, Contractor's

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contingent Assignment of Subcontracts

5.4, 14.2.2.2

Continuing Contract Performance

15.1.3

Contract, Definition of

1.1.2

CONTRACT, TERMINATION OR SUSPENSION OF THE

5.4.1.1, 11.3.9, **14**

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to

3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1

Contract Documents, The

1.1.1

Contract Documents, Copies Furnished and Use of
1.5.2, 2.2.5, 5.3

Contract Documents, Definition of

1.1.1

Contract Sum

3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, **9.1**, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5

Contract Sum, Definition of

9.1

Contract Time

3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7.1, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5

Contract Time, Definition of

8.1.1

CONTRACTOR

3

Contractor, Definition of

3.1, 6.1.2

Contractor's Construction Schedules

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contractor's Employees

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1,

Contractor's Liability Insurance

11.1

Contractor's Relationship with Separate Contractors and Owner's Forces

3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4

Contractor's Relationship with Subcontractors

1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8

Contractor's Relationship with the Architect

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1

Contractor's Representations

3.2.1, 3.2.2, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the Work

3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents
3.2

Contractor's Right to Stop the Work
9.7

Contractor's Right to Terminate the Contract
14.1, 15.1.6

Contractor's Submittals

3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2

Contractor's Superintendent
3.9, 10.2.6

Contractor's Supervision and Construction
Procedures

1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3

Contractual Liability Insurance
11.1.1.8, 11.2

Coordination and Correlation

1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications
1.5, 2.2.5, 3.11

Copyrights

1.5, **3.17**

Correction of Work

2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**

Correlation and Intent of the Contract Documents
1.2

Cost, Definition of
7.3.7

Costs

2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14

Cutting and Patching

3.14, 6.2.5

Damage to Construction of Owner or Separate
Contractors

3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4

Damage to the Work

3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4

Damages, Claims for

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Damages for Delay

6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2

Date of Commencement of the Work, Definition of
8.1.2

Date of Substantial Completion, Definition of
8.1.3

Day, Definition of

8.1.4

Decisions of the Architect

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification

9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance,
Rejection and Correction of

2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Defective Work, Definition of

3.5.1

Definitions

1.1, 2.1.1, 3.1.1, 3.5.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1

Delays and Extensions of Time

3.2., 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, **8.3**, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5

Disputes

6.3.1, 7.3.9, 15.1, 15.2

Documents and Samples at the Site

3.11

Drawings, Definition of

1.1.5

Drawings and Specifications, Use and Ownership of
3.11

Effective Date of Insurance

8.2.2, 11.1.2

Emergencies

10.4, 14.1.1.2, 15.1.4

Employees, Contractor's

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1

Equipment, Labor, Materials or
1.1.3, 1.1.6, 3.4, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13.1,
3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3,
9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5.1,
3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2,
9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4.1, 9.5.1, 9.7.1,
10.3.2, 10.4.1, 14.3, 15.1.5, 15.2.5
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 11.1.2, 11.1.3, 11.3.1, 11.3.5,
12.3.1, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
Fire and Extended Coverage Insurance
11.3.1.1
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17.1, **3.18**, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2,
11.3.7
Information and Services Required of the Owner
2.1.2, **2.2**, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5,
9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1,
13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4,
15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4.1
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
9.9.2, 9.10.1, 12.2.1, 13.5
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2
Instruments of Service, Definition of
1.1.7

Insurance
3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, **11**
Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, **11.3**
Insurance, Stored Materials
9.3.2, 11.4.1.4
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1, 11.4.1.5
Insurance Companies, Settlement with
11.4.10
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12, 15.1.4
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3,
9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1,
10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2,
13.6.1, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 13.7, 15.4.1.1
Limitations of Liability
2.3.1, 3.2.2, 3.5.1, 3.12.10, 3.17.1, 3.18.1, 4.2.6,
4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3,
11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2
Limitations of Time
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,
5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2.1, 9.3.1,
9.3.3, 9.4.1, 9.5, 9.6, 9.7.1, 9.8, 9.9, 9.10, 11.1.3,
11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3

Material Suppliers

1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5

Materials, Hazardous

10.2.4, **10.3**

Materials, Labor, Equipment and

1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 15.2.8

Mediation

8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1

Minor Changes in the Work

1.1.1, 3.12.8, 4.2.8, 7.1, **7.4**

MISCELLANEOUS PROVISIONS

13

Modifications, Definition of

1.1.1

Modifications to the Contract

1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7.1, 10.3.2, 11.3.1

Mutual Responsibility

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of
2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Notice

2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7.1, 9.10, 10.2.2, 11.1.3, 11.4.6, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1

Notice, Written

2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7.1, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14, 15.2.8, 15.4.1

Notice of Claims

3.7.4, 4.5, 10.2.8, **15.1.2**, 15.4

Notice of Testing and Inspections

13.5.1, 13.5.2

Observations, Contractor's

3.2, 3.7.4

Occupancy

2.2.2, 9.6.6, 9.8, 11.3.1.5

Orders, Written

1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2, 14.3.1

OWNER

2

Owner, Definition of

2.1.1

Owner, Information and Services Required of the

2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3

Owner's Authority

1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3.1, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3.1, 13.2.2, 14.3, 14.4, 15.2.7

Owner's Financial Capability

2.2.1, 13.2.2, 14.1.1.4

Owner's Liability Insurance

11.2

Owner's Loss of Use Insurance

11.3.3

Owner's Relationship with Subcontractors

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work

2.4, 14.2.2

Owner's Right to Clean Up

6.3

Owner's Right to Perform Construction and to Award Separate Contracts

6.1

Owner's Right to Stop the Work

2.3

Owner's Right to Suspend the Work

14.3

Owner's Right to Terminate the Contract

14.2

Ownership and Use of Drawings, Specifications and Other Instruments of Service

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17.1, 4.2.12, 5.3.1

Partial Occupancy or Use

9.6.6, **9.9**, 11.3.1.5

Patching, Cutting and

3.14, 6.2.5

Patents

3.17

Payment, Applications for

4.2.5, 7.3.9, 9.2.1, **9.3**, 9.4, 9.5, 9.6.3, 9.7.1, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3

Payment, Certificates for

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4

Payment, Failure of

9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2

Payment, Final

4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 11.4.5, 12.3.1, 13.7, 14.2.4, 14.4.3

Payment Bond, Performance Bond and

7.3.7.4, 9.6.7, 9.10.3, 11.4.9, **11.4**

Payments, Progress

9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

PAYMENTS AND COMPLETION

9

Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 11.4.8,
14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.7.4, 9.6.7, 9.10.3, 11.4.9, **11.4**
Permits, Fees, Notices and Compliance with Laws
2.2.2, **3.7**, 3.13, 7.3.7.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION
OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.3
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
Project, Definition of the
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.3**
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1,
10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14,
15.2.8, 15.4
Rejection of Work
3.5.1, 4.2.6, 12.2.1
Releases and Waivers of Liens
9.10.2
Representations
3.2.1, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1,
9.8.2, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1,
5.1.2, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field
Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and
Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and
Samples by Contractor
3.12

Rights and Remedies
1.1.2, 2.3, 2.4, 3.5.1, 3.7.4, 3.15.2, 4.2.6, 4.5, 5.3, 5.4,
6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2,
12.2.4, **13.4**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3.1, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 11.4.7,
12.1.2
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Special Inspections and Testing
4.2.6, 12.2.1, 13.5
Specifications, Definition of the
1.1.6
Specifications, The
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14
Statute of Limitations
13.7, 15.4.1.1
Stopping the Work
2.3, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4, 11.4.1.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2,
9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 11.4.7, 11.4.8,
14.1, 14.2.1

Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3,
9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, 11.4.5, **11.3.7**
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3,
12.2, 13.7
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
4.1.3
Substitutions of Materials
3.4.2, 3.5.1, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,
7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3
Surety
5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7
Surety, Consent of
9.10.2, 9.10.3
Surveys
2.2.3
Suspension by the Owner for Convenience
14.3
Suspension of the Work
5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 11.4.9, 14
Taxes
3.6, 3.8.2.1, 7.3.7.4
Termination by the Contractor
14.1, 15.1.6
Termination by the Owner for Cause
5.4.1.1, **14.2**, 15.1.6
Termination by the Owner for Convenience
14.4
Termination of the Architect
4.1.3
Termination of the Contractor
14.2.2
TERMINATION OR SUSPENSION OF THE
CONTRACT
14

Tests and Inspections
3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2,
9.10.1, 10.3.2, 11.4.1.1, 12.2.1, **13.5**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, **8.3**, 9.5.1, 9.7.1,
10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5
Time Limits
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,
4.4, 4.5, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1,
9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3,
11.4.1.5, 11.4.6, 11.4.10, 12.2, 13.5, 13.7, 14, 15.1.2,
15.4
Time Limits on Claims
3.7.4, 10.2.8, **13.7**, 15.1.2
Title to Work
9.3.2, 9.3.3
Transmission of Data in Digital Form
1.6
UNCOVERING AND CORRECTION OF
WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 7.3.4
Use of Documents
1.1.1, 1.5, 2.2.5, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.4.2
Waiver of Claims by the Contractor
9.10.5, 11.4.7, 13.4.2, 15.1.6
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 11.4.3, 11.4.5, 11.4.7, 12.2.2.1,
13.4.2, 14.2.4, 15.1.6
Waiver of Consequential Damages
14.2.4, 15.1.6
Waiver of Liens
9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, 11.4.5, **11.3.7**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7.1
Weather Delays
15.1.5.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5,
9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Notice

2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7,
9.10, 10.2.2, 10.3, 11.1.3, 11.4.6, 12.2.2, 12.2.4, **13.3**,
14, 15.4.1

Written Orders

1.1.1, 2.3, 3.9, 7, 8.2.2, 11.4.9, 12.1, 12.2, 13.5.2,
14.3.1, 15.1.2



ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

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

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

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

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

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

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

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

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

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

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

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

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled

to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

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

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

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

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

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

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term “Sub-subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

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

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

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor’s Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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

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

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

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

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

§ 9.6 PROGRESS PAYMENTS

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

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

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

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

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

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

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

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

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

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

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

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

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

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

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

risk “all-risk” or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an “all-risk” or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect’s and Contractor’s services and expenses required as a result of such insured loss.

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

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

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

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

§ 11.3.3 LOSS OF USE INSURANCE

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

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

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

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

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

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

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

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

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

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

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

§ 13.6 INTEREST

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

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

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

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

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

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

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

§ 15.2 INITIAL DECISION

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

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

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

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

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

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

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

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

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

§ 15.3 MEDIATION

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

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

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

§ 15.4 ARBITRATION

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

party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

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

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

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

§ 15.4.4 CONSOLIDATION OR JOINDER

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

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

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

SECTION 00800

SUPPLEMENTARY CONDITIONS

The General Conditions of the Contract for Construction, AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, is a part of this Contract, and is incorporated as fully as if herein set forth. For brevity, AIA Document A201 is also referred to in the Contract Documents as the "General Conditions."

These Supplementary conditions modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA Document A201, 2007 Edition. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or clause shall remain in effect.

Articles, Paragraphs, or clauses modified or deleted have the same numerical designation as those occurring in the General Conditions.

Comply with all requirements of Title 38 Public Bid Law for this project. If in conflict with that included in the Supplementary Conditions, provisions of Title 38 Public Bid Law shall govern.

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

Delete the last sentence in 1.1.1, and add the following sentence:

"The Contract Documents shall include the Bidding Documents (advertisement or invitation to Bidder), Instructions to Bidders, sample forms and the Contractors bid, and any modifications made thereto by Addendum and Supplementary Conditions."

Insert the following after the word "Sub-subcontractor" in the sixth line of Sub-paragraph 1.1.2: except as set forth in Paragraph 5.3 and Paragraph 5.4,

Add the following at the end of 1.2.1:

"Contractor acknowledges that not every condition is details and that not every item necessary for complete construction is identified in the construction documents."

Add the following new Paragraph 1.2.4:

" "Related Work" in the specifications is solely a guideline. Contractor shall identify all related work and properly coordinate all the related work"

Add the following new Subparagraph 1.1.9:

The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents as used in reference to the Contractor, shall be interpreted to mean that which the Contractor know (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the care, skill, and diligence required by the Contract Documents. Analogously, the

expression “reasonably inferable” and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill, and diligence required of the Contractor by the Contract Documents

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Subparagraph 1.2.4.

1.2.4 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to and govern the execution of the work of all Sections of the Specifications."

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.5.1 Delete the first sentence. In the second sentence after “Instruments of Service, add “,which include the drawings and specifications, and add the word “or the Owner’s” after the word “consultants””

1.5.2 Delete “Architect and the Architect’s consultants” at the end of the paragraph.

Add the following to 1.5.2.

” The Architect may, with the concurrence of the Owner and after signing a waiver form furnished by the Architect, furnish to the Contractor versions of Drawings, Specifications and other documents in electronic form. The Contract Documents executed or identified in accordance with subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulated electronic means involving computers. The Contractor shall not transfer or reuse Drawings, Specifications and other documents in electronic or machine readable form without the written consent of the Owner.”

Add the following new Paragraph 1.7:

1.7 CONFIDENTIALITY

1.7.1 The Contractor agrees not to knowingly or negligently communicate or disclose at any time to any person or entity any information in connection with the Work or the Project, except (i) with prior written consent of the Owner, (ii) information that was in the public domain prior to the date of this Agreement, (iii) information that becomes part of the public domain by publication or otherwise not due to any unauthorized act or omission of the Contractor, or (iv) as may be required to perform the Work or by any applicable law.

1.7.2 The Contractor, at any time upon the request of the Owner, shall immediately return and surrender to the Owner all copies of any materials, records, notices, memoranda, recordings, drawings, specifications, and mock-ups and any other documents furnished by the Owner or the Architect to the Contractor.

1.7.3 The Contractor shall cause all Subcontractors or any other person or entity performing any services, or furnishing any materials or equipment, for the Work to warrant and represent all items set forth in this Paragraph 1.7.

1.7.4 The representations and warranties contained in this Paragraph 1.7 shall survive the complete performance of the Work or earlier termination of this Agreement

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Delete 2.2.1 and substitute the following:

2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work, furnish to the Contractor reasonable evidence that Owner has the financial ability to fulfill the Owner's obligations under the Contract.

2.2.2 In the first sentence, delete the word "Subparagraph 3.7.1," and add the words "Subparagraphs 3.3.5 and 3.7.1".

2.2.3 Add to the beginning of the first sentence the words "Upon request of the Contractor,".

2.3 OWNER'S RIGHT TO STOP THE WORK

Add the following at the end of 2.3:

"The Owner's failure to stop the Work shall not in any way limit or otherwise modify the Contractor's obligations to perform the Work in accordance with the Contract Documents. The foregoing rights of the Owner shall be in addition to those rights set forth in Article 14, paragraphs 14.2 and 14.3 hereof and any other rights the Owner may have at law or in equity. Any such order issued by the Owner which is determined to have been inappropriate shall not be deemed to be a breach of the Contract, but shall be deemed to be a suspension for the convenience of the Owner as provided in Paragraph 14.3."

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

Delete the sentence which reads "Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect."

Add the following as new Paragraph 2.5:

2.5 EXTENT OF OWNER RIGHTS

2.5.1 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (i) granted in the Contract Documents, (ii) at law or (iii) in equity.

2.5.2 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

ARTICLE 3 - CONTRACTOR

3.1 GENERAL

Add the following 3.1.4 to 3.1:

"3.1.4 The Contractor must be fully qualified under any "Licensing Law for Contractors" in effect at the time and place of the work before submitting his proposal. In the State of Louisiana, only the bids of Contractors and Subcontractors duly licensed under La. R.S. 37:2151, et seq., will be considered if licensing is required. The Contractor shall insure that his Subcontractors are fully licensed in accordance with the law."

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY THE CONTRACTOR

Add the following 3.2.5, 3.2.6, 3.2.7, 3.2.8 and 3.2.9 to 3.2

"3.2.5 After reporting to the Architect any error, inconsistency or omission he may discover in the Contract Documents, the Contractor shall not proceed with any Work so affected without the Architect's written approval.

3.2.6 In case of inconsistencies in the Specifications or the Drawings, or between the Specifications and Drawings, the Architect will determine which requirement will be the most consistent with design intent, and this requirement will be complied with by the Contractor. Additionally, if a project element is drawn on one drawing and not on another drawing having similar conditions, the Contractor is responsible for the element throughout the project.

3.2.7 The Contractor shall verify all grades, elevations and dimensions indicated on the drawings and report any errors or inconsistencies in them to the Architect before commencing Work.

3.2.8 If there is a discrepancy between scale drawings and written dimensions, the written dimensions shall take precedence over scale dimensions. Although Drawings are drawn to scale as indicated, and dimensions are given, in the case of remodeling or fitting work to existing conditions, the Contractor shall work to existing measurements. Any discrepancy or conflict between dimensions shall be referred to the Architect for final decision.

3.2.9 By executing the Contract, the Contractor represents to the Owner that prior to entering into the Contract, Contractor has examined and inspected the site and any existing improvements, and satisfied itself as to the condition thereof and reviewed all data and reports pertaining to the site and that adequate provision has been made in the Contract Price to fully perform the Work in light of those examinations and inspections. Contractor shall not be entitled to extra payment, and the contract sum shall not be increased, for conditions at the work site and in connection with the work that could have been determined by a careful examination at the site by the Contractor"

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 Delete the last sentence of paragraph 3.3.1 and replace with "If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, then the Contractor shall be held harmless for any loss or damage solely resulting therefrom." After the last sentence, add the following:

"The Contractor shall review any specified construction or installation procedure including those recommended by the any product manufacturer. The Contractor shall advise the Architect:

1. if the specified procedure deviates from good construction practice;

2. if following the specified procedure will affect any warranties;
3. if the Contractor has any objections to the procedure;
4. if the specified procedure will create an unsafe condition; or
5. if the Contractor knows the specified procedure will violate any applicable law, statute, ordinance, building code, rule, regulation or order."

Add the following Subparagraphs 3.3.4, 3.3.5 and 3.3.6:

"3.3.4 Workmanship shall be of the highest quality, and shall be performed by experience mechanics skilled in the applicable trade. Work shall be installed rigidly, true, level, plumb, straight, and in alignment, fastened or anchored securely and durably, and executed in accordance with manufacturers recommendations and printed instructions. Fasteners, anchors, and attachments shall be concealed where possible. Abutting components shall have parallel faces. Joint widths shall be parallel and as small as possible unless otherwise indicated."

"3.3.5 If any of the Work is required to be inspected or approved by any public authority or other certification body, the Contractor shall cause such inspection testing or approved to be performed or obtained, the cost of any of which is included in the Contract Sum. No inspection performed or failed to be performed by Owner hereunder shall be deemed a waiver of any of the Contractor's obligations hereunder or be construed as an approval or acceptance of the Work or any part thereof."

"3.3.6 If the Contract Documents, the written instructions of the Architect, laws, ordinances, rules or regulations, or any public authority require any of the Work to be specifically tested or inspected, the Contractor shall give the Architect timely notice of its readiness for inspection and testing, and if the test or inspection is performed by an authority other than the Architect and the date set for such test or inspection

3.4 LABOR AND MATERIAL

3.4.3 Delete this paragraph and substitute with the following:

Contractor and its employees, officers, agents, representatives, and Subcontractors shall conduct themselves in an appropriate and professional manner, in accordance with the Owner's requirements, at all times while working on the Project. Any such individual who behaves in an inappropriate manner or who engages in the use of inappropriate language or conduct while on Owner's property, as determined by the Owner, shall be removed from the Project at the Owner's request. Such individual shall not be permitted to return without the written permission of the Owner. The Owner shall not be responsible or liable to Contractor or any Subcontractor for any additional costs, expenses, losses, claims or damages incurred by Contractor or its Subcontractor as a result of the removal of an individual from the Owner's property pursuant to this paragraph. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them

Add the following 3.4.4, 3.4.5, 3.4.6, 3.4.7 to 3.4:

"3.4.4 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications).

3.4.5 By making requests for substitutions based on Subparagraph 3.4.4 above, the Contractor:

- .1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects 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 become apparent; and
- .4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.4.6 Should a Contractor propose a substitute material or method assembly that is of questionable quality to the Architect, suitable tests may be required to establish a basis for acceptance or rejection. Such tests will be paid for by the Contractor and conducted in accordance with Article 13.5, Tests and Inspections.

3.4.7 Architect's decision on all substitution requests is final and binding."

3.5 WARRANTY

3.5.1 Add the following to the end of 3.5:

"The warranty provided for in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty or remedy provided by law or required in the Contract Documents. If any piece of equipment requires replacing during this warranty period the one year warranty shall be reinstated on replacement date and start over again. The commencement date of ALL warranties of every kind shall be the date of Substantial Completion."

3.6 TAXES

Add the following Clause 3.6.1.1 to Subparagraph 3.6.1:

"3.6.1.1 The National World War II Museum is not tax-exempt from sales, consumer, use or similar taxes in regard to construction contracts by independent contractors."

3.7 PERMITS, FEES AND NOTICES

Add the following to 3.7.1:

"3.7.1.1 The Contractor, at his expense, shall record a Notice of the Contract with the Surety Bond required hereby attached within two (2) working days of signing of the Contract but in any event before Work is commenced, in compliance with the Louisiana Private Works Act La. R.S. 9:4801 et seq, and thereafter timely advise the Owner of the date of recordation and the recordation information. Additionally, all change orders and updated surety bonds will be recorded.

3.7.1.2 Permits: The Contractor shall pay for the Safety and Permits review and building permit fee and the State Fire Marshal review fee. All other required permit and inspection fees shall be paid for by the Contractor per the General Conditions, Subparagraph 3.7.1..

Add the following to 3.7.2:

"3.7.2.1 On award of Contract, unless otherwise specified, the Contractor shall take immediate steps to notify all Public Utilities and other interested parties of the requirements of the Work, making necessary arrangements with these companies for the removal or rearrangement of any wires, poles, pipes, conduit, vaults, sewers, drains, catch basins, service lines, utilities and similar facilities, both overhead and underground, to accommodate in a proper manner the Work which is indicated in the Contract Documents. The Contractor shall pay for all replacement, removal, rerouting, relocation or alteration of existing facilities that are within or outside the property limits and are necessary to carry out the Work or to conform to the new conditions necessitated by the Work."

3.7.3 Add "If the Contractor observes that portions of the Contract Documents are in variance with applicable laws, statutes, ordinances, building codes, rules, regulations and orders, the Contractor shall promptly notify the Architect and Owner in writing."

3.7.4 After the word "Contract Documents" in line 4, add the following: "and which could not reasonably have been discovered by the Contractor through a reasonable site investigation." In the fifth line add "written" before the word "notice. In the sixth line delete "21" and replace with "7" At the end of Paragraph 3.7.4, add the following:

"Under no circumstance shall an adjustment in the Contract Time or Contract Sum be permitted, however, in connection with a concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably would have been disclosed by the Contractor's (1) prior inspections, tests, reviews and preconstruction services for the Project, or (2) inspections, tests, reviews and preconstruction services which the Contractor had the opportunity to make or should have performed in connection with the Project."

3.9 SUPERINTENDENT

Delete 3.9.2 and substitute the following 3.9.2 and add 3.9.3.1 following 3.9.3:

"3.9.2 The Contractor shall, prior to the commencement of construction operations, submit to the Architect for approval the name of the superintendent and assistants he proposes to assign to the job and shall further submit a resume of the experience of the superintendent and assistants and such other data as will attest to their competence and qualifications. This information shall be submitted in duplicate for the guidance of the Architect and the Owner, and assignment of a superintendent to the job shall not be made until the Owner and the Architect have approved this selection. A full time Superintendent is required to be present at the site at all times construction activities are taking place."

"3.9.3.1 The Contractor shall designate in writing to Owner and keep on the Work during its progress a competent Superintendent satisfactory to Owner. The Superintendent shall be changed upon written request by Owner, but shall not be changed by the Contractor except with the consent of Owner, unless the Superintendent ceases to be in its employ. The Superintendent shall represent the Contractor and all directions given to him by Owner shall be binding as if given to the Contractor directly. The superintendent shall devote full time to the Work and shall maintain his office on the site of Work. He shall direct, coordinate and supervise all Work, inspect all materials delivered to the Project to ascertain whether or not they comply with the requirements of the Contract Documents, and reject all non-conforming materials or workmanship."

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1: Add the following: For projects with a contract sum greater than \$1,000,000.00, the Contractor shall include with the schedule, for the Owner's and Architect's information, a network analysis to identify those tasks which are on the critical path, i.e. where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. A revised schedule shall be submitted with each Application and Certificate for Payment. No payment will be made until this schedule is received.

3.10.3: Add the following: If the work is not on schedule, as determined by the Architect, and the Contractor fails to take action to bring the work on schedule, then the Contractor shall be deemed in default under this Contract and the progress of the work shall be deemed unsatisfactory. Such default may be considered grounds for termination by the Owner for cause in accordance with 14.2.

Add: 3.10.4 Submittal by the contractor of a schedule or other documentation showing a completion date for his work prior to the completion date stated in the contract shall not impose any obligation or responsibility on the Owner or Architect for the earlier completion date.

Add: 3.10.5 In the event the Owner employs a commissioning consultant, the Contractor shall cooperate fully in the commissioning process and shall require all subcontractors and others under his control to cooperate. The purpose of such services shall be to ensure that all systems perform correctly and interactively according the provisions of the Contract Documents.

3.11: Add the following: This requirement is of the essence of the contract. The Architect shall determine the value of these documents and this amount shall not be approved for payment to the Contractor until all of the listed documents are delivered to the Architect in good order, completely marked with field changes and otherwise complete in all aspects.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 In the third line delete the word "approved" and replace with "reviewed"

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.7 In the last line, delete the word "approved" and replace with "reviewed".

3.12.8 In the first and second lines, delete the word "approved" and replace with "reviewed", In the last line, delete the word "approval" and replace with "review".

3.12.9 In the line, delete the word "approval" and replace with "review"

Add the following Subparagraph 3.12.11:

"**3.12.11** The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) re-submittal. 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 re-submittals."

3.13 USE OF SITE

Add the following Subparagraphs 3.13.1, 3.13.2, 3.13.3 and 3.13.4:

"3.13.1 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor. Additionally, the Contractor shall bear all risk of loss as to materials and equipment which are to be used in the Work and that are stored off the Project site."

"3.13.2 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner."

"3.13.3 Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent area. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions, consistent with Subparagraph 10.1.2. Without limitation of any other provision of the Contract Documents. Work shall be performed in a manner that does not interfere with the occupancy or use of Owner's premises."

"3.13.4 Without prior approval of the Owner, the Contractor shall not permit any worker to use any existing facilities at the Project site, including, without limitation, lavatories, entrances and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site, as amended from time to time. The Contractor shall maintain the Project site in a safe and clean condition, and shall exercise its best efforts to minimize dirt and dust at the Project site. The Contractor shall deliver to Owner a plan setting forth in detail all actions and procedures that the Contractor shall undertake in order to maintain the Project site in a safe and clean condition, prior to the commencement of Work. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved."

3.18 INDEMNIFICATION

Delete under 3.18 INDEMNIFICATION subparagraph 3.18.1, and substitute the following

"3.18.1 To the fullest extent permitted by law the Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18."

ARTICLE 4 - ARCHITECT

4.1 ARCHITECT

4.1.2 Delete 4.1.2 in its entirety.

4.1.3 Delete the words "against whom the Contractor has no reasonable objection and".

4.2 ADMINISTRATION OF THE CONTRACT

4.2.1 In the first sentence, after the words "as described in";, add the words "Architect's Contract with Owner and in". Also in the first sentence, after the words "and will";, add the words "to the extent consistent with the Architect's Contract."

4.2.5 Add to the end of the sentence the words "for Owner's review and consideration."

4.2.7: In the first line, delete "and approve". In the last line, delete "approval" and replace with "review".

4.2.9 In the first sentence, delete the word "determine" and add the words "recommend to the Owner." Also in the first sentence, after the words "and issue", add the words "to Owner for its review and consideration."

Delete Subparagraph 4.2.10 and substitute the following:

4.2.10 If a Project Representative is employed at the site by the Architect, the duties, responsibilities and limitations of authority of the Project Representative shall be as set forth in the edition of AIA Document B352, current as of the date of the Contract for Construction

4.2.11 Add the following sentence to the end of Subsection 4.2.11:

"If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them."

4.2.14 Insert the following sentence between the second and third sentence of Subsection 4.2.14:

"If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them."

ARTICLE 5 - SUBCONTRACTS

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

Delete the first sentence of 5.2.1 and substitute the following:

"The Contractor shall furnish within seven (7) calendar days of signing the Agreement to the Owner and Architect, in writing, the names of the persons and/or entities, (including those who furnish materials or equipment), proposed to perform the work of each portion of the Work. In addition, submit the names of the manufacturers of any long lead items that would potentially impact the progress of the Work and is the Contractor's responsibility to identify these manufacturers. Unless the aforementioned information is submitted, no extensions of time will be considered if extenuating circumstances exist affecting timely

product delivery. Furthermore, no payments will be made to the Contractor until all information is furnished. Additionally the Contractor shall submit all subcontractor and material supplier contracts to the Owner

5.2.4 Delete 5.2.4, and substitute the following:

"The Contractor shall not make any substitution for any Subcontractor nor allow the substitution of any Subcontractor who has been accepted by Owner, unless the substitution is required and previously approved by Owner. Acceptable reasons for substitution (other than where required by Owner) shall be limited to the following"

1. Failure of the Subcontractor or Sub-subcontractor to perform according to approved schedules or other provisions of the Contract Documents or a breach by the Subcontractor of its subcontract or purchase agreement; or
2. Other reasons which would reasonably render the Subcontractor or Sub-subcontractor unable to perform the Work according to the Contract Documents".

Add the following Subparagraph 5.2.5:

"5.2.5 All portions of the Work performed by a Subcontractor or Sub-subcontractor shall be pursuant to a written agreement between the Contractor and the Subcontractor (and where appropriate between Subcontractors and Sub-subcontractors) which shall contain provisions that:

1. preserve and protect the rights of Owner under the Contract Documents with respect to the portion of the Work to be performed under the subcontract (or sub-subcontract) so that the subcontracting will not prejudice such rights;
2. require that all Work be performed in accordance with the requirements of the Contract Documents;
3. require submission to the Contractor of applications for payment under each subcontract to which the Contractor is a party;
4. require that all requests for additional compensation and extensions of time with respect to subcontracted portions of the Work shall be submitted to the Contractor (via any Subcontractor or Sub-subcontractor where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like requests by the Contractor upon Owner; and
5. obligate each Subcontractor or Sub-subcontractor specifically to consent to the provisions of this Agreement."

5.3 SUBCONTRACTURAL RELATIONS

5.3 Change the first portion of the first sentence as follows: "By appropriate written agreement, the Contractor shall require.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.2 Change the first sentence as follows: "Upon such... be equitably adjusted for reasonable increases in direct costs, defined in 7.3.7 herein, resulting from the suspension."

Add the following Paragraph 5.5:

5.5 OWNER IS THIRD PARTY BENEFICIARY

"5.5.1 All subcontracts and sub-subcontracts shall be in writing and shall include a provision stating that the Owner is a third party beneficiary (as defined in LA Civil Code Art. 1978, et seq.) of any such subcontract or sub-subcontract. Without limiting other actions by the Owner that may manifest the Owners intention to avail itself of such third party benefit, the failure of the Owner to object to the engagement of such subcontractor or sub-subcontractor shall be conclusively presumed to manifest such intention. The Owner and the Architect shall be provided with copies of all subcontracts and sub-subcontracts."

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

Delete 6.1.3 in it's entirety and replace with the following

"6.1.3 The list of Owner's contractors may include but is not limited to the following:

1. One or more exhibit fabrication contractors
2. One or more Audio Visual contractors and integrators
3. One or more lighting contractors
4. Airplane and macro artifact installation firm

6.1.3.1. Based on information received from the Owner's separate contractors, the Contractor shall include and update as required, line items for those contractor's respective installation activities, including durations, on the Contractor's schedule. The Contractor shall make any revisions to the construction schedule as reasonably required to accommodate the Owner's contractors. The Contractor shall communicate and /or meet with the Owner's contractors as necessary to ensure proper coordination of the respective installation activities as work progresses. . The Contractor shall afford reasonable opportunity for the Owner's contractors to perform their work in accordance with the schedule. Some of the Owner's contractor's installation activity will take place in earlier stages of construction, some activity will take place after the building is enclosed but not conditioned and some activities will require conditioned space to install millwork or sensitive electronics and will take place after the building is conditioned. Notwithstanding the provisions in 6.1.1, the obligation to accommodate and provide reasonable access to the Owner's contractors for installation shall not be a cause for a claim for delay damages by the Contractor even though it may require the schedule to be adjusted."

6.1.4 Delete this Subparagraph in its entirety.

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the first and third lines, before the word "costs" insert that word "reasonable."

6.3 OWNER'S RIGHT TO CLEAN UP

Delete the words "the Architect will"

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL

Add the following Subparagraph 7.1.4:

"7.1.4 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection shall be accompanied by a complete itemization of costs including labor, material and subcontracts. Labor and materials shall be itemized in the manner prescribed above in a format and extent of information approved by the Owner. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over One Thousand Dollars (\$1,000.00) be approved without such itemization."

Add the following Subparagraph 7.1.5:

"7.1.5 As part of the pre-construction conference submittals, the contractor is to submit the following prior to the commencement of work.

Fixed job site overhead cost itemized with documentation to support daily rates.
Bond Premium Rate with supporting information from the General Contractor's carrier.
Labor Burden by trade for both Subcontractors and General Contractor.
Internal Rate Charges for all significant company owned equipment.

Failure to submit this information as part of the pre-construction submittals shall prohibit the Contractor from claiming these items as costs on any change order issued on the project."

7.2 CHANGE ORDERS

Add the following Subparagraphs 7.2.2, 7.2.3 and 7.2.4:

"7.2.2 Change Order cost for Change Directives or Change Orders whether based on a stipulated sum or calculated on actual time and material shall be limited to the following items:

1. Cost of labor including labor burden defined in 7.3.7.1. herein..
2. Cost of materials, supplies or equipment incorporated into the finished product or consumed.
3. Rental costs of machinery or equipment excluding hand tools. If equipment is owned by the Contractor, the rental rates shall be the lower of the average rate in the geographic region or 75% of the published AED rate for the appropriate rental timeframe.
4. Cost of bonds and liability insurance, permit fees and sales taxes.
5. Additional cost for onsite supervision only if the critical path is impacted and the contract time is extended.

"7.2.3 Unallowable Costs: The following items are part of overhead and profit and shall not be included as a separate cost in a Change Order:

1. Salaries or compensation of the Contractor's personnel at the Contractor's principle or regional or branch offices.
2. Expenses of the Contractor's principle office, regional office, branch office or field office.
3. Any part of the Contractor's capital expenses including interest on the Contractor's capital for the Work.
4. Overhead and general expenses not specifically allowed in 7.2.2
5. Costs due to negligence of the Contractor, any Subcontractor or anyone directly employed by any of them or for whose acts any of them may be liable, including but not limited to the correction of

defective or non conforming work, disposal of materials or equipment wrongly supplied or making good any damage to property.

6. As built drawings, safety officers, local delivery and pick up, telephone, small tools, consumables, pickup or other jobsite trucks or autos, jobsite safety or other meetings, engineering or job factors.

“7.2.4 Pricing for additive Change Orders if not performed on a time and material basis shall be based on accurate and reasonable projected labor and material costs for the additional work required by the change request and not on industry standardized unit pricing; nor should it include a “job factor” as an additional mark up. Additionally, premiums for the General Contractor’s bond may be included, but after the markup is added to the cost of the work”

7.3.3 Add at the end first sentence ..as directed by the owner and the Architect and in accordance with 7.2.2 and 7.2.3 and 7.3.11

7.3.7

At the end of the paragraph delete “shall be limited to the following “ and add ...in accordance with 7.2.2, 7.2.3 and 7.3.11.”

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.6 After the first sentence add “Qualifications of any type from the Contractor and/or subcontractor are not permitted on the cost quotation or the Construction Change Directive”

7.3.7 In the fourth line, after "an allowance for overhead and profit in accordance", add “with clauses 7.3.7.1 Add the following “For wages paid for direct labor personnel, the labor burden markup is limited to applicable payroll taxes, worker’s compensation insurance, unemployment compensation, and social security taxes.

7.3.11.1 through 7.3.11.6 below." In the second sentence, after the words "as the Architect," insert the words "or Owner."

7.3.7.3 Add to the end of the sentence:

"(when Contractor-owned equipment or equipment owned by an affiliate of Contractor is used, rates no greater than seventy five percent (75%) AED rates);"

7.3.7.5 To the end of the sentence, add “only if the contract time is extended.”

7.3.8 Delete 7.3.8 in its entirety.

7.3.9 Change the paragraph to read: "When the Owner and Contractor agree on the adjustments in the Contract Sum and Contract Time, such agreement shall be effective immediately."

Add the following 7.3.10 to 7.3.

"7.3.10 In Subparagraph 7.3.6, the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

- .1 The allowable combined overhead and profit for the Contractor, for Work performed by the Contractor's own forces, shall be eight (8%) percent of the cost.
- .2 The allowable combined overhead and profit for the Contractor, for Work performed by the Contractor's Subcontractor, shall be eight (8%) percent of the amount due the Subcontractor.
- .3 The allowable combined overhead and profit for each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, shall be eight (8%) percent of the cost.
- .4 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed in 7.3.7. Where major cost items are Subcontracts, they shall be itemized also."

ARTICLE 8 - TIME

8.1 Definitions

Add the following:

8.1.5 The Contract Time shall not be changed by the submission of a schedule that shows an early completion date unless specifically authorized by change order

8.2 PROGRESS AND COMPLETION

Add the following 8.2.1.1, 8.2.1.2, 8.2.1.3 and 8.2.1.4 to 8.2.1:

"8.2.1.1 Time is of the essence, the Contractor shall furnish sufficient forces, construction plant and equipment, and shall work such hours of overtime or perform a continuous operation if necessary to insure the prosecution of the Work in accordance with the approved progress schedule. It is imperative that the Work be completed on the date scheduled or before, and necessary allowances shall be made in figuring the job to allow for the close construction schedule. The Contractor shall "accelerate" his Subcontractors to the fullest extent and he shall impress upon his Subcontractors the expedience required to overcome delays on their part or in the delivery of materials. He shall be alert to any and all happenings that affect the progress of the project. If the Contractor should fall behind in the progress schedule, it is mandatory that he take immediate steps, whatever required, to put the project back on schedule. Neither the Contractor nor any of his Subcontractors nor anyone working on the Project shall be entitled to any compensation whatsoever for acceleration of the Work for any reason for which the Contractor or any of his Subcontractors or anyone else working on the Project under the control of the Contractor is responsible, even if that responsibility is only a partial cause of the need to accelerate

8.2.1.2 The above section 8.2.1.1 is a contract requirement and is to be followed to the fullest extent and meaning.

8.2.1.3 The Architect and his consultants will incur additional expenses if due to the fault of the contractor, the Contractor fails to achieve substantial completion of the project within the time stated in the contract

subject to such extensions as may be granted under 8.3. The additional expenses will be derived by the actual hourly amount paid to the person performing the work including payroll taxes and insurance times a factor of two, plus all normal reimbursable expenses. All expenses will be substantiated with time sheets. This cost is not part of, but in addition to any liquidated damages. These charges to the contractor will begin after the first 30 days of delay in completion of the work and may not exceed \$300 per day.

8.2.1.4

Time is of the essence and completion of the work must be within the time stated in the Contract, subject to such extensions as may be granted under Section 8.3, and the Contractor waives and dispenses with any requirement for putting in default. The Contractor agrees to commence work not later than ten (10) days after the date of written Notice to Proceed from the Owner and to substantially complete the project within the time stated in the Contract. The Owner will suffer financial loss if the Project is not substantially complete in the time set forth in the Contract. The Contractor and his Surety shall be liable for and shall pay to the Owner the sum of One Thousand Dollars (\$1000) as fixed, agreed and liquidated damages for each consecutive calendar day (Saturdays, Sundays and holidays included) of delay until the entire project is substantially complete and record drawing are submitted complete for the first thirty (30) days beginning with the first day beyond the completion date indicated on the "Notice to Proceed", and thereafter Two Thousand Dollars (\$2,000) for each consecutive calendar day of delay until the work is substantially complete and record drawing are submitted complete and all of the work listed on the punch list is not complete thereafter."

8.2.2 In the first sentence, delete the word "knowingly."

8.3 DELAYS AND EXTENSIONS OF TIME

Delete Subparagraphs 8.3.1, and substitute the following:

8.3.1 "If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, or of any employee of either, or of a separate Contractor employed by the Owner, or by changes ordered in the Work, as reflected in Change Orders approved by the Owner which provide for the Contract Time to be enlarged, or by fire, unavoidable casualties or other causes beyond the Contractors control (provided that any such fire, unavoidable casualty of other cause is entirely beyond the control of the Contractor and has not arisen, directly or indirectly, out of any act or omission of the Contractor), or by delay authorized by the Owner caused by other causes which the Owner determines may justify the delay, then the Contract Time shall be extended by Change Order to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time unless the performance of the Work is, was, or would have been delayed by any other cause for which Contractor is responsible. The stoppage must be due to acts or omissions attributable to the Owner or third parties over which Contractor has no control. Damages for the Contractor are limited to the cost of the superintendent requiring full time presence at the project site during the extension of time and any other cost directly attributable to the extension of time, that can be substantiated by the Contractor. For delays attributable to both the Owner or Architect and the Contractor (Concurrent Delays), the Contractor shall receive additional time for the "Concurrent Delay" period but shall not receive additional compensation."

Add the following 8.3.1.1 and 8.3.1.2. to 8.3.1

"8.3.1.1 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction, an increase in the contract time due to weather shall not be cause for an increase in the contract sum. The following are considered reasonably anticipated days of adverse weather on a monthly basis that would prevent work from proceeding. These days are included in the contract time as allowances and not subject to time extensions.

September	4 days	April	7 days
October	3 days	May	5 days
November	5 days	June	6 days
December	8 days	July	6 days
January	11 days	August	5 days”
February	10 days		
March	8 days		

8.3.1.2 The Contractor will be due extended fixed job-site overhead for time delays only when complete stoppage of work occurs causing a contract completion extension, and the Contractor is unable to mitigate financial damages through replacement work. The stoppage must be due to acts or omissions solely attributable to the Owner. In all cases the Contractor is to notify the Designer in writing as required by article 15.1.2. Reasonable proof may be required by the architect that alternate work could not be preformed. Reasonable proof may be required by the architect that the stoppage affected the Completion Date

Add the following to 8.3.2 :

"If in the opinion of the Architect the delay event does not impact overall performance of the work, no extension of time or additional compensation will be granted."

ARTICLE 9 - PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following to 9.2.:

"At the pre-construction conference, the Contractor shall submit to the Owner and the Architect a Schedule of Values prepared as follows:

1. The Schedule of Values Form of submittal shall be on a 8-1/2" x 11" sheets of white paper.
2. The Contractor shall use the Index of this Specification as a basis for format for listing costs of Work for Sections under Division 1 through 16. Use each Section number under each Division for sub-titles. Each Section shall be subdivided into separate line items for the total cost (with overhead and profit) of separate items in Sections.
3. Round off cost figures to the nearest ten (10) dollars. The Total of all items shall equal the total Contract Sum.

This schedule, when approved by the Owner and Architect, shall be used only as a basis for the Contractor's Application for Payment."

9.3 APPLICATION FOR PAYMENT

Delete 9.3.1 and substitute the following 9.3.1:

"9.3.1 When applying for a progress payment, the Contractor shall submit to the Architect an original and three (3) copies of a sworn and notarized itemized Application for Payment, using AIA Document G702 "APPLICATION AND CERTIFICATE FOR PAYMENT" supported by G703 Continuation Sheet, latest editions, and supported by any additional data substantiating the Contractor's right to payment as the Owner

or the Architect may require. An updated construction schedule shall accompany each Application for Payment; provided, however, that such updates shall not serve to extend the Contract Time unless expressly approved by the Owner, in a written Change Order. Contractor's failure to submit an updated schedule may result in delayed payment."

Add the following 9.3.1.3, 9.3.1.4 9.3.1.5, 9.3.1.6 and 9.3.1.7 to 9.3.1:

"9.3.1.3 Applications for payment, approved by the Architect through certificates of payment, in the amount of ninety-five percent (95%) of the portion of the work completed on or about the last day of the month, less the aggregate of previous payments, will be sent to the Owner on or about the tenth day of the next month. Five percent (5%) of the amount due at each monthly estimate will be withheld by the Owner and not released until a clear lien and privilege certificate is presented by the Contractor at time of final payment.

"9.3.1.3.1 Contractor and Owner hereby agree to waive the provisions of La. R.S. 9:4815, including, but not limited to waiver of those provisions of Louisiana law requiring placement of retainage into an escrow account, the use of an escrow agent, and the timing and process for retainage payments. To the extent, and only to the extent, that this waiver is invalidated by legislation or final judgment of a court of competent and controlling jurisdiction, the following provisions will apply:

- .1 Contractor and Owner agree that a representative of Owner's Lender for this Project shall serve as escrow agent and that the escrow account shall be established at Owner's Lender for this Project;
- .2 Owner shall not be obligated to consent to or execute any waiver related to retainage release, unless and until Contractor achieves final completion under the Contract Documents, and all requirements of the Contract Documents associated with final payment and retainage release, including but not limited to Section 5.2.1 above, have been fully satisfied;
- .3 Contractor shall not submit a request for release of retainage, in whole or in part, without first seeking Owner's agreement and consent; any request by Contractor for release of retainage, in whole or in part, without Contractor's first having sought Owner's agreement and consent, shall be null and void; and
- .4 Contractor shall provide to the Owner copies of all communications, (including but not limited to retainage release requests) with the escrow agent; transmittal of such communications to the Owner shall be made at the same time and in the same manner that such communications are transmitted to the escrow agent."

9.3.1.4 Provided an Application for Payment is received by the Architect not later than the last day of a month and satisfactory documentation and progress has been established for the record drawings, the Owner shall make payment in accordance with subparagraph 9.3.1.3 above to the Contractor not later than the thirtieth (30th) day of the next month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than thirty (30) days after the Architect receives the Application for Payment.

9.3.1.5 When applying for a progress payment, the Contractor shall submit to the Architect, along with his application for payment, an original and three (3) copies of his certificate for payment appropriately complete and ready for the Architects approval signature."

9.3.1.6 For the Contractor, subcontractor or sub-subcontractor, who is in an application for payment, a lien waiver form is required.

9.3.1.7 Accompanying each Application for Payment, the Contractor shall submit a letter, addressed to the Owner, stating that the Documents and Samples at the Site referenced in Article 3.11 are being maintained at the Site in good order, and have been marked to record field changes and selections

currently as of the date of the Application for Payment. Contractor's failure to submit the aforementioned letter or the if the Architect's review of the record drawings indicates they are not current, may result in delayed payment "

9.3.3 Add the following to the end of the paragraph:

"Provided the Contractor has received payment from the Owner for material or labor which is the subject of a lien filed by a Subcontractor or material supplier, or has otherwise satisfied its payment obligations to Contractor arising out of this Contract, Contractor will indemnify and hold Owner harmless for such lien claim, and will immediately cause the lien to be removed. Should Contractor fail to remove such lien within 10 days, the Contractor will be responsible for liquidated damages of \$500 per calendar day beyond the 10 days and the Owner shall have the right to remove the lien at Contractor's cost, including but not limited to attorney's fees. The Contract Sum shall be reduced by the amount of such costs incurred by Owner."

9.4 CERTIFICATES FOR PAYMENT

9.4.2 Delete the third sentence in its entirety. In the fourth sentence, delete the word "However."

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 Add "In the event a lien is filed against the project by a subcontractor or sub-subcontractor, laborer or supplier, the Architect, if notified, shall so advise the Owner, and the Owner shall have the right to withhold such sums as necessary to pay the lien, so long as the lien remains of record."

Add the following Subparagraph 9.5.4:

"**9.5.4** The Owner shall not be deemed to be in breach of this Contract by reason of the withholding of any payment pursuant to any provision of the Contract Documents if the Work for which payment shall have been withheld has been rejected by the Owner, the Architect or any governmental authority or agency."

9.6 PROGRESS PAYMENTS

9.6.2 Delete the phrase: "no later than seven days" from the first sentence.

After the end of the second sentence, add the following:

"R.S. 9:2784 (A) and (C) requires a Contractor or Subcontractor to make payment due to each Subcontractor and supplier within fourteen (14) consecutive days of the receipt of payment from the Owner. If not paid, a penalty in the amount of 1/2 of 1% per day is due, up to a maximum of 15%, from the expiration date until paid. The contractor or subcontractor, whichever is applicable, is solely responsible for payment of a penalty."

9.6.4 Delete the first two sentences of Subparagraph 9.6.4 and add the following to the end of the Subparagraph:

"Pursuant to La. R.S. 38:2242, when the Owner receives any claim of nonpayment arising out of the Contract, the owner shall deduct 125% of such claim from the Contract Sum. The Contractor, or any interested party, may deposit security, in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder of mortgages of the parish where the Work has been done. When the Owner receives original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum."

9.6.7 Delete 9.6.7 in it's entirety.

9.7 FAILURE OF PAYMENT

Delete 9.7 paragraphs in their entirety and replace with the following:

"If the Contractor submits a timely payment in accordance with the Contract Documents and the Owner does not pay the Contractor the amounts certified by the Architect within (7) seven days following the date established in the Contract Documents, the Contractor may upon (30) thirty days written notice to the Owner and the Architect stop work until payment of the approved and uncontested amount is made. The contract time shall be extended and the contract sum increased for extended overhead in accordance with the appropriate provisions of the Contract Documents if the stoppage is the sole cause for a delay in achieving substantial completion of the project. Notwithstanding anything to the contrary contained in the Contract Documents, the Owner may withhold any payment to the Contractor hereunder, and shall not be deemed to be in breach of Owner's obligations under this Contract, if and for so long as the Contractor fails to perform any of its obligations hereunder or otherwise is in default under any of the Contract Documents or for Work that is rejected by the Owner or the Architect or by any public authority; provided, however, that any such withholding shall be limited to an amount sufficient to cure any such default or failure of performance by the Contractor. No good faith exercise by the Owner of its rights under this Subparagraph 9.7.2 shall entitle the Contractor to cease performance of the Work."

9.8 SUBSTANTIAL COMPLETION

9.8.1 Add to the end of the first sentence:

"; provided however, that as a condition precedent to Substantial Completion, the Owner has received all permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project. Substantial completion of the building HVAC system does not start until substantial completion of the entire project is established. Early delivery of a dust free spaces shall not constitute substantial completion of these spaces Substantial completion of the building HVAC system and elevator does not start until substantial completion of the entire project is established."

Add the following to 9.8.2:

"9.8.2.1 Prior to inspection by the Architect as required in Subparagraph 9.8.3, the Contractor shall notify the Architect that the Project is ready for inspection by the State Fire Marshal's office. A "punch list" of items not completed and the dollar value related thereto will be prepared by the Architect. A monetary value will be assigned to this list, which is approximately twice the estimated actual value of the "punch list" work. Cost of these items shall be prepared in the same format as the schedule of values. None of these funds shall be due the Contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount in the remaining balance of the Contract, then the project shall not be accepted as substantially complete. If funds remaining are less than that required to complete the work, the Contractor shall pay the difference. At the end of the 45 day lien period payment shall be approved for all punch list items completed up to that time. After that payment, none of the remaining funds shall be due the contractor until all punch list items are completed and are accepted by the Architect.

Add the following clauses 9.8.4.1, 9.8.4.2 and 9.8.4.3 to Subparagraph 9.8.4

“9.8.4.1 If all punch list items have not been completed within sixty (60) calendar days of Substantial Completion, through no fault of the Architect or the Owner, the Owner may hold the Contractor in default. If the Owner finds that the Contractor is in default, the Surety shall be notified. If, within thirty (30) days after notification, the Surety has not taken reasonable steps to complete the punch list, the Owner may contract to have the balance of the work completed, and pay for such work with the unpaid funds remaining in the Contract Sum, including retainage. Owner may shorten or eliminate the sixty (60) day period if, in Owner's good faith opinion, shortening or eliminating the period mitigates damages or costs to the Contractor, Surety or Owner. The Architect or Owner may add items to the punch list for the first 30 days following Substantial Completion. Thereafter incomplete or deficient work shall be completed and/or repaired as acceptable to the Owner and Architect by the Contractor as required by the Contract. Any items added during the 30-day period that are not completed prior to final completion, must be completed during the correction-of-work period.”

9.8.4.2. The signed Certificate of Substantial Completion shall be forwarded to the Owner with a punch list, if any, and with the Contractor's payment request.”

9.8.4.3 Upon expiration of the applicable lien period, the Contractor shall obtain the Clear Lien and Privilege Certificate and forward the certificate with final payment requests to the Architect.”

9.8.5 Delete this Subparagraph, and substitute the following:

“9.8.5 The Certificate of Substantial Completion approved by the Owner shall be submitted to the Contractor for its written acceptance of responsibilities assigned in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of the remaining unpaid Contract Sum, less retainage, such amounts as Architect and Owner shall determine for incomplete work, and unsettled Claims. The payment shall be sufficient to increase the total payment to 95 percent of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims and liquidated damages.”

Add the following 9.8.6, 9.8.7, 9.8.8., 9.8.9 and 9.8.10 to 9.8:

“9.8.6 When the Architect has declared the Work substantially completed, the Architect shall deliver to the Contractor a notice addressed to the Recorder of Mortgages, signed by the Owner, to the effect that the Owner has, on the date of the notice, accepted the Work. The Contractor must record this formal acceptance of the Work by the Owner with the Recorder of Mortgages in accordance with the law within three (3) days of receipt of the formal acceptance.

9.8.7 Forty five (45) days after acceptance of the Work has been recorded, the balance due the Contractor shall be paid by the Owner provided that:

- a. The Contractor shall furnish the Architect with a certificate signed and sealed by the Recorder of Mortgages and dated after the expiration of the forty five (45) day lien period, certifying that no liens or privileges have been recorded in the Mortgage Office against said property or against the Contractor growing out or on account of the execution of the contract.
- b. The Contractor and the Owner shall sign a notice addressed to the Recorder of Mortgages directing the said Recorder of Mortgages to cancel and efface the lien created by the recordation of the contract, and the Contractor must deliver to the Architect a final certificate from the Recorder of Mortgages stating that his lien has been effaced. This notice shall not be recorded until the Owner has paid the Contractor the final certificates of the Architect.
- c. Regardless of the foregoing provisions, Owner will still be allowed to withhold sums from final payment for the same reasons set forth in paragraph 9.5.1.

9.8.8 The Mortgage Office and the Recorder of Mortgages mentioned in this Article are defined to be the Office and Recorder of Mortgages for the Parish in which the Work is performed.

9.8.9 The expense of, Acceptance, and Lien and Privilege Certificates shall be borne by the Contractor."

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 Delete this Subparagraph, and substitute the following:

"9.9. 1 Owner or its designee has the right to occupy or use ahead of schedule all or any substantially completed or partially completed portion of the Project or Work when such occupancy and use are in its best interest, notwithstanding the time of completion for all of the Work. If the Contractor incurs additional costs or is delayed in the performance of the Work as a result of the occupancy except for occupancy upon Partial Completion, after notice to Owner, as required by this Section, a Change Order or Change Instruction will be issued by Owner to the Contractor for such costs. After Owner has taken occupancy of all or any substantially completed portion of the Work, the Contractor shall not disrupt the use and occupancy of Owner to complete the punch list for the Work but shall, at the discretion of Owner, complete the punch list after normal working hours."

9.10 FINAL COMPLETION AND FINAL PAYMENT

Delete subparagraph 9.10.1 and substitute the following:

"9.10.1 When the Work is substantially completed, the Contractor shall notify the Architect in writing that the work will be ready for final inspection on a definite date, which shall be stated in the notice. The notice shall be given to the Architect at least ten (10) days prior to the date stated for final inspection. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for more than two (2) inspections to determine whether the Work or designated portion thereof has attained Final Completion in accordance with the Contract Documents.

9.10.1.1 If the Architect determines that the state of preparedness is as represented, the necessary arrangements will be made to have the final inspection on the date stated in the notice, or as nearly thereafter as is practicable. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Architect's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in subparagraph 9.10.2 have been fulfilled."

9.10.2 In the first sentence, after the words "to the Architect," add the words "in form and substance acceptable to the Owner." Also in the first sentence, add item (5) as follows:

"(5) any warranties, submittals and equipment manuals required by the Contract Documents to be provided to the Owner."

Add the following to **9.10.2 (1)**:

" (6) and submitting a 45 day clear Lien Certificate from the Clerk of Court."

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.2 After the words "bearing on," insert the words "health and."

10.2.5 In the first sentence, delete the words "(other than damage or loss insured under property insurance required by the Contract Documents)" and substitute the words "unless directed otherwise by Owner."

10.3 HAZARDOUS MATERIALS

10.3.1 After the words "resulting from," add the words "any unanticipated." At the end add "See Art 7.6.9 of the Agreement."

10.3.2 In the first sentence, change the words "the material or substance" to "any unanticipated material or substance." Delete the third and fourth sentences in their entirety. In the fifth sentence, delete the words "upon written agreement of the Owner and Contractor." And add ", except in the event that the Contractor is responsible for mildew/mold referenced in Art. 7.6.9 of the Agreement or the Hazardous Materials defined in Paragraph 10.4."

10.3.4 Revise to read as follows:

"10.3.4 The Owner shall not be responsible under Paragraph 10.3 for any mildew/mold referenced in Art 7.6.9 of the Agreement or for materials and substances brought to the site by the Contractor. Contractor warrants that the Work or Work site will not be used or operated in any manner that will result in the storage, use, treatment, manufacture and disposal of any Hazardous Materials (hereinafter defined) upon the Work or Work site or which will result in Hazardous Materials contamination (hereinafter defined). Hazardous Materials as used herein means (1) any hazardous waste as defined by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et. seq.) as amended from time to time, and regulations promulgated thereunder; (2) any hazardous substance as defined by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. 9601, et. seq.) (CERCLA), as amended from time to time, and regulations promulgated thereunder; (3) asbestos; (4) polychlorinated biphenyls; (5) urea formaldehyde; (6) any substance the presence of which is prohibited by any applicable environmental law or regulation including but not limited to the Hazardous Material Transportation Act, as amended (49 U.S.C. 1804, et. seq.), the Toxic Substance Control Act, as amended (15 U.S.C. 2601, et. seq.), the Louisiana Environmental Quality Act (LSA-R.S. 30:201, et. seq.), and or by any other legal requirements affecting the Work or the Work site. The term Hazardous Materials Contamination means the surface water, ground water, air, or other elements on, or of, any other property as a result of Hazardous Material at any time emanating from the Work or Work site."

"10.3.4.1 In addition to and without limiting the generality of any other provision of this Contract. Contractor shall and hereby does agree to defend, indemnify and hold Owner, its affiliates, officers, directors, administrators, employees and agents, harmless from and against any and all losses, damages, expenses, fees, claims, demands, causes of action, judgments and corrective Work and other clean up activities, arising out of or in the manner connected with (1) the release or threatened release (as those terms are defined in CERCLA and the rules and regulations promulgated thereunder, as from time to time amended) by Contractor or Contractor's employees, agents, invitees, licensees, Subcontractors and representatives, of any Hazardous Materials including but not limited to the mildew/mold referenced in Art. 7.6.9 of the Agreement, or (2) any occurrence of Hazardous Materials including but not limited to the Work or Work site. The provisions of this paragraph shall survive any payment or satisfaction of this Contract."

10.3.6 After the words "remediation of" add the words "an unanticipated."

10.4 EMERGENCIES

Add to the end of this paragraph:

"The Contractor shall notify the Owner and Architect of the emergency in as timely a manner as practicable."

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 After the words "Project is located" add the words "and which carry a Best's Rating of A VII or higher for insurance and bonds, or are otherwise acceptable to Owner."

Add the following Clause 11.1.1.9 to 11.1.1:

11.1.1.9 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises Operations (including X, C and U coverage as applicable).
2. Independent Contractor's Protective.
3. Products and Completed Operations for a term extending 3 years after completion of Contractor's work.
4. Personal Injury Liability with Employment Exclusion deleted.
5. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
6. Owned, non-owned and hired motor vehicles.
7. Broad Form Property Damage including Completed Operations.

11.1.2 Add the following to the end of this Subparagraph:

"Coverages written on a claims-made basis must have a policy date and retroactive date that predate the data of commencement of the Work and a termination date no earlier than the date to which coverages are required to be maintained after final payment date under this contract.

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits and coverages, or greater limits and coverage where required by law. Note that it is acceptable if Contractors provide a minimum \$1,000,000/\$2,000,0000 Commercial General Liability policy in combination with a \$25,000,000 Excess Liability Umbrella policy.

1. Workers' Compensation

- a. State: Statutory Limits
- b. Bodily Injury and Property Damage: \$1,000,000 Per Accident
\$1,000,000 Disease Each Employee

- c. This policy shall contain an Alternate Employee Endorsement and a Waiver of Subrogation Endorsement in favor of Owner.
- d. Benefits stipulated by labor contracts where applicable.
- 2. Commercial General Liability (including Premises/Operations, Independent Contractor's Protective, Products and Completed Operations, Broad Form Property Damages): It is acceptable if Contractors provides a minimum \$1,000,000/\$2,000,000 General Liability policy in combination with a \$25,000,000 Excess Liability policy
 - a. Bodily Injury and Property Damage: \$2,000,000 Each Occurrence
\$4,000,000 Aggregate per project)
 - b. Products and Completed Operations:

To be maintained for three (3) years after final payment: \$2,000,000 Aggregate
 - c. Property Damage Liability Insurance shall provide coverage for X, C, and U perils
 - d. Broad Form Property Damage Coverage shall include completed operations
 - e. Incidental Medical Malpractice
 - f. Contractual Liability, (Hold Harmless Coverage): covering the indemnity obligations assumed by Contractor under 3.18 for the full amount of the limits hereunder. The cost of this Contractual Liability (Hold Harmless Coverage) is included in the Contract Price

Bodily Injury and Property: \$1,000,000 each occurrence
\$2,000,000 Aggregate
 - g. Personal Injury: \$1,000,000 Aggregate with employment exclusion deleted
 - h. If cranes are used in the performance of the Work, Contractor will be responsible for loss or damage to any equipment until it is in its final resting place on the building site.
- 3. Business Auto Liability (Including owned, non-owned and hired vehicles):

Bodily Injury and Property Damage: \$1,000,000 Combined Single Limit.
- 4. Umbrella Liability Insurance policy covering the excess over the limits specified for all employer's liability, commercial general liability, and business auto liability insurance required hereunder with minimum limits of \$10,000,000 aggregate per policy year.
- 5. The Contractor shall cause the Owner, Owner exhibit designer, Architect and the Architect's consultants to be named as additional insureds on the Contractor's liability insurance required by this Paragraph 11.1.
- 6. If this insurance is written on the Comprehensive General Liability policy form, the Certificate shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD form 25 will be acceptable.

7. Professional Liability: Contractor or the subcontractors performing the delegated design shall carry professional liability for \$1,000,000 for each required delegated design work in this contract.

11.1.3 After the first sentence, add the following:

"In addition, certified copies of all insurance policies required will be provided to the Owner within ten (10) days of Owner's written request for those copies." In the third sentence, change "30 days" to "60 days." In the fourth sentence, delete the words "and are reasonably available."

Add the following clauses 11.1.4, 11.1.5, 11.1.6 and 11.1.7 to Subparagraph 11.1.1:

"11.1.4 The Contractor shall furnish a Certificate of Insurance which shall specifically set forth evidence of all coverage required by Subparagraphs 11.1.1, 11.1.2, and 11.1.3. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverages or limits. Failure of the Owner to collect certificates does not void the requirement to obtain insurance."

11.1.5 The acceptance of any certificate of insurance evidencing the insurance coverages and limits required in the Contract does not void the requirements to obtain insurance."

"11.1.6 Contractor agrees that the insurance specified in this Subparagraph 11.1 shall be primary insurance and without right of contribution from any other insurance or self-insurance program which may be maintained by or available to the Owner."

"11.1.7 Insurance affected or procured by Contractor shall not reduce or limit the Contractor's contractual obligation to indemnify and defend the Owner for claims made or suits brought which result from or are in connection with the performance of this contract."

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 Add the following sentence after the first sentence:

" Contractor shall provide Owner-Contractor Protective insurance with limits the same as the general liability limits specified herein. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract."

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.3 Revise this Subparagraph to read as follows:

"11.3.3 The Contractor shall include the Owner, Architect and Architect's Consultants as additional insureds on the Contractor's Comprehensive or Commercial General Liability Policy.

11.3 PROPERTY INSURANCE

11.3.1 Revise this Subparagraph to read as follows:

11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" policy form in the amount of the initial Contract Sum as well as subsequent modifications thereto of the entire Work at the site on a replacement cost basis.. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as

provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the Property required by this Paragraph 11.3 to be covered, whichever is later. "

The property insurance provided pursuant to this article shall have a deductible of not more than \$25,000.00, and the Contractor shall pay deductibles."

11.3.1.4 Revise this clause to read as follows:

"**11.3.1.4** The Contractor, Subcontractor or Vendor shall provide insurance coverage at their expense for portions of the Work stored off site and for portions of the Work in transit at replacement cost".

Add the following clause 11.3.1.6 to Subparagraph 11.3.1:

"**11.3.1.6** The Insurance required by Paragraph 11.3 is not intended to cover machinery, tools or equipment owned or rented by the Contractor that are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment."

11.3.2 Add "Unless otherwise provided," to the beginning of the first sentence:

11.3.3 Add the following words to the end of the second sentence:

"to the extent covered by such actually purchased and maintained by Owner, under this Paragraph 11.4."

11.3.5 Add a semi colon and the following to the end of the first sentence in 11.3.5:

" ;however, this waiver by the Owner shall be limited to amounts that are reimbursable under separate insurance policies and this waiver shall **not** apply to any deductible (including, but not limited to the \$1 million deductible under the policy currently in effect)."

.

11.3.6 Delete this Subparagraph.

11.3.10 Delete the last sentence of this Subparagraph.

.

11.4 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

11.4.1 Revise this Subparagraph to read:

"**11.4.1** The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds shall be obtained through a company on the U.S. Treasury List, complying with Louisiana Revised Statutes 9:4801,et.seq. and qualified to do business in the State in which the project is being constructed, and which is acceptable to and in form approved by the Owner and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to one hundred percent (100%) of the Contract Sum."

Add the following clauses 11.4.1.1, 11.4.1.2 and 11.4.1.3 to Subparagraph 11.4.1:

"**11.4.1.1** The Contractor shall deliver the required bonds to the Owner upon execution of the agreement, or if the Work is to be commenced prior thereto in response to a Letter of Intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished."

"11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney."

"11.4.1.3 Form of bonds shall be AIA Document A312 or surety company's form which meets AIA's Specifications and is acceptable to The National World War II Museum."

Insert Subparagraphs 11.4.3, 11.4.4 and 11.4.5 as follows:

"11.4.3 The condition of this Performance and Payment Bond shall be that should the Contractor herein not perform the contract in accordance with the terms and conditions hereof, or should the Contractor not remedy latent or other defects attributed to faulty workmanship or materials within the prescriptive period as governed by Louisiana law, or should said Contractor not fully indemnify and save harmless the Owner from all costs and damages which it may suffer by said Contractor's non-performance or should said Contractor not pay all persons who have fulfilled obligations to perform labor and/or furnish materials in the prosecution of the Work provided for herein, including by way of example workmen, laborers, mechanics and furnishers of materials, machinery, equipment and fixtures, then said Surety agrees and is bound to so perform the Contract and make said payment(s). Surety shall remain obligated and bound under the Performance and Payment Bond for the full prescriptive period as provided in Louisiana Civil Code Art. 3500."

"11.4.4 The Surety shall be bound in solido with the Contractor. The executed bonds, together with the bonding agent's power of attorney, shall be furnished to the Owner along with the executed contract, and the number of copies reasonably required by him. The bonds shall provide that the surety waives the requirements of notice of any extension of time granted to the Contractor."

"11.4.5 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the Surety to affix thereto a certified and current power of attorney."

ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 Delete the third sentence. At the end of the paragraph delete the last sentence and add the following sentences: If the Contractor fails to correct nonconforming work within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) after notification, the Surety has not corrected the nonconforming work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4.

12.2.2.2 After the words "first performed," add the word "properly".

12.2.2.3 Delete this clause.

12.2.5 In the first sentence, after the words "Contract Documents", add the words "or at Law".

Add the following to 12.2:

“**12.2.6** The corrective remedies set forth in this Section 12.2 are not exclusive and shall not deprive the Owner of any action right or remedy otherwise available to it for breach of any of the provisions of the Contract Documents and for any damages suffered by Owner as a result of such defects in the Work.”

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1 Delete this subparagraph in its entirety and substitute the following:

"The Contract shall be governed by the law of the State of Louisiana. Any and all actions arising under or otherwise concerning this Agreement shall be brought in either a state or federal court in New Orleans, Louisiana, and shall not be transferred to a court outside New Orleans, Louisiana."

13.5.1 delete the second sentence and substitute the following:

"The Contractor shall make arrangements for such tests, inspections and approvals with the Testing Laboratory provided by the Owner, and the Owner shall bear all related costs of tests, inspections and approvals. If the Owner doesn't test a portion of the work, not testing does not relieve the Contractor of his responsibilities under this Agreement or give the contractor a right of action against the Owner for any subsequent deficiencies or failures that might have been identified through proper testing "

13.5.3 In the third sentence, the words "repeated procedures", add ",including retesting,"

Add the following Paragraphs 13.8,13.9,13.10,13.11 and 13.12:

"13.8 RECORD DRAWINGS"

"**13.8.1** A complete set of drawings shall be maintained by the Contractor at the construction site for the purpose of showing "as-built" conditions. The drawings shall be kept up-to-date to show all changes and variations and each entry shall be dated and verified as made. These drawings shall be reviewed monthly at the scheduled meeting to establish satisfactory documentation and progress.. A complete set of record drawings shall be furnished to the Architect at the completion of the Work and prior to Final Payment."

"13.9 NO WAIVER"

13.9.1 No consent or waiver, express or implied, by either party to or of any breach or default by the other in the performance of any of its obligations shall be deemed or construed to be a consent or waiver to or of any other breach or default by such party. Neither the silence of Owner nor Owner's failure to complain of any act or failure to act of the Contractor or to declare the Contractor in default, irrespective of how long such failure continues, shall constitute a waiver of any right of Owner."

"13.10 ASSIGNMENT"

"**13.10.1** This Agreement shall not be assigned, delegated or transferred in whole or in part by the Contractor nor shall the Contractor assign any monies due or to become due to it without the prior written consent of Owner."

"13.11 RECORDATION REQUIREMENTS"

"**13.11.1** The Contractor shall record the Contract. The Contractor shall not begin construction until he has a copy of the recorded Notice of Contract and the NTP."

"13.12.2 After the Architect has declared the Work substantially complete, the Contractor shall record the Notice of Termination. "

13.13 STATUTORY EMPLOYER

"13.31.1 Owner shall be considered the statutory employer of Contractor, its Subcontractors and their employees who provide work or services under this Agreement in accordance with Louisiana R.S.23: 1031 or R.S.23: 1061. Thus Owner is to be granted the exclusive remedy protection of Louisiana R.S.23: 1032 and it shall be liable to pay compensation benefits if the immediate employer, Contractor or its Subcontractors, as applicable, are unable to meet obligations under the Louisiana Workers Compensation Statute for work or service that performed under this Agreement. The parties agree that the recognition of the Statutory Employer status is made pursuant to R.S.23: 1061 of the Louisiana Workers Compensation Statute for work or service that is performed under this Agreement. The parties agree that the recognition of the Statutory Employer status is made pursuant to R.S.23: 1061 of the Louisiana Workers Compensation Statute and that Owner is not the actual employer of any of the employees of Contractor or any of its Subcontractors. Further, it is acknowledged that Owner has no control or involvement in the hiring, firing, or direct supervision or direction of any such employees. Contractor shall include corresponding language in all subcontracts reflecting Owners statutory employer status."

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1 In the first sentence, before the words "the Work", add the words "all of"; change the words "30 consecutive days" to "60 consecutive days".

14.1.1.3 Delete the words "within the time stated in" and substitute the words ~'pursuant to"; at the end of the sentence, delete the word "or".

14.1.1.4 Delete.

14.1.3 Delete from "seven days' written notice" to the end of the paragraph, and replace with "...upon 15 days written notice to the Owner and the Architect, terminate the contract and recover from the Owner payment for executed work in accordance with the schedule of values including profit on the work properly performed. The Contractor shall not be paid for damages resulting from the termination or profit for work not performed."

14.1.4 In the first sentence, before the words "the Work", add the words "all of". In the first sentence, change "seven additional days" to fifteen additional days".

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 Add the following 14.2.1.5, 14.2.1.6, 14.2.1.7 and 14.2.18 to Subparagraph 14.2.1:

"14.2.1.5 Breaches any warranty made by the Contractor under or pursuant to the Contract Documents."

"14.2.1.6 Fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all requirements of the Contract Documents."

"14.2.1.7 Fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents."

14.2.1.8 Fails to complete the punch list within the lien period as provided in 9.8.2.1.”

14.2.2 In the first sentence, delete the words "upon certification by the Architect that sufficient cause exists to justify such action".

14.2.2.1 Add to the end of the sentence the words "or Owner, as well as all materials on site and off site for which the Owner has already paid."

14.2.3 Add the following sentence:

"Termination by the Owner shall not suspend assessment of liquidated damages against the surety."

14.2.4 In the second line, replace “Architect’s services” with Architect’s and Owner’s construction manager services”

Add the following subparagraph 14.2.5:

“**14.2.5** If an agreed sum of liquidated damages has been established, termination by the Owner under this Article will not relieve the Contractor and/or surety of his obligation under the liquidated damages provisions and the Contractor and/or surety shall be liable to the Owner for per diem liquidated damages.”

14.3.2.1 Add “partially or solely” before the word “responsible”

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

14.4.2 Delete this Paragraph, and substitute the following:

14.4.2.1”The Owner may, as its option, terminate the Contract in whole or from time to time in part at any damages or time by written notice to the Contractor. Upon any such termination, Contractor agrees to waive any claims for damages, including loss of anticipated profits, on account thereof and, as the sole right and remedy of Contractor. Owner shall pay Contractor in accordance with 14.4.2.5 below.”

14.4.2.2 "The provisions of the Contract which survive final acceptance of the Work shall remain in full force and effect after such termination to the extent provided in such provisions."

14.4.2.3 "Upon receipt of any termination notice from Owner, Contractor shall, unless the notice directs otherwise, immediately discontinue the Work on the date and to the extent specified in the notice; place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not discontinued; promptly make every reasonable effort to procure cancellation upon terms satisfactory to Owner all order and subcontracts to the extent they relate to the performance of the discontinued portion of the Work and shall thereafter do only such subcontracts to the extent they relate to the performance of the discontinued portion of the Work and shall thereafter do only such Work as may be necessary to preserve and protect Work already in place or in progress and to protect materials, equipment and Owner's property on the site or in storage or in transit."

14.4.2.4 "Upon any such termination the obligations of the Contract shall continue as to portions of the Work already performed and to bona fide obligations assumed by Contractor prior to the date of termination."

14.4.2.5 "Upon termination, Contractor shall be entitled to be paid the full cost of Work properly done by Contractor to the date of termination not previously paid for, less sums already received by Contractor on

account of the portion of the Work performed, but in no event will any loss of anticipated overhead or profits be paid . If at the date of such termination Contractor has properly prepared or fabricated offsite any goods for subsequent incorporation into the Work, and if Contractor delivers such goods to the site or to such other place as Owner shall reasonably direct, then Contractor shall be paid for such goods or materials."

14.4.3 Delete this Subparagraph and substitute the following:

"**14.4.3** Upon a determination by a court of competent jurisdiction that termination of the Contractor was wrongful or otherwise improper, such termination shall be deemed a termination for convenience pursuant to Paragraph 14.4 and the provisions of Subparagraph 14.4.2 shall apply."

ARTICLE 15 – CLAIMS AND DISPUTES

15.1 CLAIMS

15.1.2 NOTICE OF CLAIMS

Add "15.1.2.1 A general "Reservation of Rights" and similar stipulations without specific identification of the underlying related claim will not be recognized under this Contract as a claim, and shall have no effect."

15.1.4 After the first sentence, add the following:

"Such notice shall include facts sufficient to allow Architect and Owner to review bases for the claim, and to substantiate the Contractor's quantification of the claim amount. Otherwise, Contractor's failure to provide timely and complete notice shall constitute a rebuttable presumption that Owner has been prejudiced by such failure which shall and which has the effect of Contractor's waiver of such claim damages as might have been mitigated by Owner's receipt of timely and complete notice.
Failure to submit claims in accordance with this Paragraph 15.1 shall be deemed a waiver thereof."

15.1.5 CLAIMS FOR ADDITIONAL TIME

15.1.5.1 Add the following at the end of 15.1.5.1:

"Contractor's Claim shall also include a current update of the construction schedule which shows the nature and extent of the delay for which a claim is made."

Add the following four clauses to 15.1.5.1

".1 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the bases for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the bases of the Claim. The Contractor's request for weather related days shall be considered only for days over the allowable number of days stated herein for reasonably anticipated days of adverse weather on a monthly basis"

".2 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due in part to the fault of the Contractor."

"3 No extension of Contract Time will be granted due to the non-availability of materials or non-availability of labor within the control of Contractor or foreseeable by Contractor."

"4 Add the following Subparagraph:

The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11	days	May	5	days	September	4	days
February	10	days	June	6	days	October	3	days
March	8	days	July	6	days	November	5	days
April	7	days	August	5	days	December	8	days

The Contractor shall ask for total adverse weather days. The Contractor's request shall be considered only for days over the allowable total number of days stated above for accumulative days of months applicable to the contract time for this project in accordance with 8.3.1.1.

Note: Contract is on a calendar day basis."

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete this article as written in its entirety, and substitute the following:

"Claims for Consequential Damages.

Owner shall not be liable at any time for Contractor's or Subcontractors' home office overhead expense or consequential damages should the Work be delayed, suspended, accelerated or disrupted for whatever reason or any other consequential damages arising out of or related to this Contract. The Contractor shall not be liable for damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages or other specified damages, when applicable, in accordance with the requirements of the Contract Documents."

Add the following Subparagraph to 15.1.6:

"15.1.6.1 Unconditional Obligation to Proceed. Notwithstanding anything herein to the contrary, the Contractor will proceed with the Work so as to complete the Work on or before the Substantial Completion date even if it has a dispute with Owner concerning the amount to be paid under Article 4.3 or any extension of time which is or could be due the Contractor pursuant to a Change Order, a Change Instruction or otherwise, except to the extent Contractor has the right to suspend the performance of the Work or terminate this Agreement in the event of the Owner's failure to pay undisputed amounts after given an opportunity to cure per this Agreement."

15.2 INITIAL DECISION

15.2.1 At the end of the second sentence, delete the words "indicated in the Agreement" and substitute the words "unless otherwise determined by Owner."

15.2.3 Delete the Paragraph, and substitute the following:

"In evaluating claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party."

15.2.4 Change the last sentence to read: "Upon receipt of the response or supporting data, if any, the Initial Decision Maker will take one of the actions described in Article 4.4.2."

15.2.5 Change the first sentence to read: "when required by the Owner, the Initial Decision Maker will approve or reject claims by written initial decision, which ... or both." Delete the second sentence. Delete the words "final and binding on the parties but" from the third and last sentence.

15.2.6 Delete the end of this Paragraph which provides "subject to the terms of Section 15.2.6.1."

15.2.6.1 Delete this Paragraph.

15.3 MEDIATION

Delete 15.3 MEDIATION and all subparagraphs in their entirety. Also, delete references to arbitration wherever they may appear in other articles of the General Conditions

15.4 ARBITRATION

Delete 15.4 ARBITRATION and all its subparagraphs in their entirety. Also, delete references to arbitration wherever they may appear in other articles of the General Conditions.

Add the following paragraph 15.5.

"**15.5** The Contractor shall continue to perform its obligations under this Contract during the pendency of any dispute by the parties hereto."

Add Article 16 as follows:

"ARTICLE 16 ADDITIONAL MISCELLANEOUS PROVISIONS"

"16.1 AUDIT

The Owner shall be afforded access to all Contractor's financial and related records, books, correspondence, instructions, drawings, receipts, vouchers, memorandum and other similar data and materials relating to this Contract, and the Contractor shall preserve all such records for a period of three (3) years after the later of (a) the Final Payment is made by the Owner to Contractor, or (b) the final resolution of any dispute between the Owner and Contractor arising from the obligations created by this Contract

"16.2 INCONSISTENCIES NOT WAIVER."

The failure of the Owner to insist in any one or more instances upon the strict performance of any of the Contractor's obligations shall not constitute a waiver of Owner's right to insist on that performance at any future time. The failure of the Owner to exercise any option it may possess under this Contract shall not waive the Owner's right to exercise that option at any time. Any act or omission by the Owner that may be inconsistent with any of the Owner's rights under this Contract shall not waive the Owner's right to exercise such rights. No waiver or modification of any of the Owner's rights under this Contract shall be construed as a waiver or modification of any other of the Owner's rights under this Contract. If the Owner makes any payment to the Contractor in a situation that payment will not constitute a waiver of any of the Owner's rights with respect to that breach. No waiver, modification or discharge of any provisions of this Contract shall be deemed to have been made unless expressed in writing and signed by authorized representatives of both parties."

“16.3 REASONABLENESS OF COST OF WORK ITEMS

Owner can audit and challenge the reasonableness of any cost item submitted to Owner for payment. Contractor will respond reasonably to any request for substantiation that the amount has been paid (or is payable) as well as the reasonableness of such amount.”

ARTICLE 17 ARCHITECT’S RESPONSIBILITY

Nothing in this Agreement shall modify the Architect’s responsibilities under the Owner/Architect Agreement.

ARTICLE 18 NOTICES

Under all provisions of this agreement, the Contractor waives his right to require written notice from the Owner.

END OF SUPPLEMENTARY CONDITIONS

Contractor Release and Waiver

We, the undersigned, in consideration of payments made to us, hereby waive, release, and relinquish any and all claims, demands, and rights of lien, including those granted under Louisiana's Private Works Act R.S. 9:4801 et seq., against The National World War II Museum, Inc. and WWII Pavilions, Inc, their officers, directors, members, employees, agents, and affiliated or related entities, any of their respective lenders or parties furnishing financing for all work, labor, materials, machinery, or other goods, equipment, or services done, performed, or furnished through and including the last day of _____, 20____, for or in connection with the construction of the Floyd Education & Collections Pavilion at 1060 Magazine Street for The National World War II Museum, Inc., including work under the construction agreement or purchase order between the undersigned and _____ dated _____, _____, including but not limited to all change orders under that agreement. We hereby waive and release any mechanic's liens, materialman's and like liens, including but not limited to those granted by Louisiana's Private Works Act, and all rights to file any such liens in the future against the real property on account of the work, labor, materials, machinery, or other goods, equipment, or services done, performed, or furnished through and including the last day of the month of _____, 20____.

We further warrant and represent that any and all valid labor and/or material and equipment bills now due and payable on the above-described project, on behalf of the undersigned, have been paid in full through the date of this waiver, or will be paid from the funds obtained in connection with the execution of this waiver. We further warrant and represent that there have been no defaults under any contracts between the undersigned and The National World War II Museum, Inc.

Contractor

By _____
Title _____
Date _____

Submitted as Payment Request # _____
Under contract dated _____
Between _____ and _____

Subcontractor Release and Waiver

We, the undersigned, in consideration of payments made to us, hereby waive, release, and relinquish any and all claims, demands, and rights of lien, including those granted under Louisiana's Private Works Act R.S. 9:4801 et seq., against The National World War II Museum, Inc. and WWII Pavilions, Inc., their officers, directors, members, employees, agents, and affiliated or related entities, any of their respective lenders or parties furnishing financing for all work, labor, materials, machinery, or other goods, equipment, or services done, performed, or furnished through and including the last day of _____, 20____, for or in connection with the construction of the Floyd Education & Collections Pavilion at 1060 Magazine Street Renovations for The National World War II Museum, Inc., including work under the construction agreement or purchase order between the undersigned and _____ dated _____, _____, including but not limited to all change orders under that agreement. We hereby waive and release any mechanic's liens, materialman's and like liens, including but not limited to those granted by Louisiana's Private Works Act, and all rights to file any such liens in the future against the real property on account of the work, labor, materials, machinery, or other goods, equipment, or services done, performed, or furnished through and including the last day of the month of _____, 20____.

We further warrant and represent that any and all valid labor and/or material and equipment bills now due and payable on the above-described project, on behalf of the undersigned, have been paid in full through the date of this waiver, or will be paid from the funds obtained in connection with the execution of this waiver. We further warrant and represent that there have been no defaults under any contracts between the undersigned and The National World War II Museum, Inc.

Subcontractor

By _____
Title _____
Date _____

Submitted as Payment Request # _____
Under contract dated _____
Between _____ and _____

SUMMARY OF WORK**SECTION 01010****RELATED DOCUMENTS**

- A. The general provisions of the Contract, including General and Supplementary Conditions, and other Division 1 - General Requirements apply to the work specified in this Section.
- B. Division 1 Sections describe the administrative and procedural requirements and are as follows:
 - 1. 01010 - Summary of Work
 - 2. 01030 - Alternates
 - 3. 01200 - Project Meetings
 - 4. 01290 - Payment Procedures
 - 5. 01400 - Procedures and Quality Control
 - 6. 01410 - Testing Laboratory Services
 - 7. 01500 - Construction Facilities and Temporary Controls
 - 8. 01600 - Materials and Equipment
 - 9. 01700 - Project Closeout

1.02 PROJECT IDENTIFICATION

- A. The work contemplated and covered in these Specifications and the accompanying Drawings consist of the Contractor furnishing all labor, materials, equipment, supervision, and all other services required including all work reasonably intended in the Contract Documents for:

**THE NATIONAL WORLD WAR II MUSEUM
FLOYD EDUCATION & COLLECTIONS PAVILION
1060 MAGAZINE STREET
NEW ORLEANS, LA 70130
MBA Project No. 12274**

- B. The drawings which accompany and compliment the Specifications are identified on the title sheet.

1.03 GENERAL WORK DESCRIPTION

- A. **Scope of Services:** The work of this Contract, except as otherwise specified shall include all labor, materials, equipment and facilities necessary to produce the required result, all transportation and services, and all materials and equipment incorporated and intended to be incorporated in such results. The Work includes all fees, taxes, permit costs, insurance premiums, and costs for overhead, superintendence, temporary facilities, and other direct and indirect costs and expenses incidental to the performance of the Work.
- B. **Note:** Media/social networking posts must be submitted first to and approved by the Museum
- C. No requirements for “Buy American” or “Wage Rates”

- D. Work Under Other Contracts (N.I.C. Items): The Owner has awarded a separate contract for performance of certain construction operations at the site indicated on the drawings as “NIC” or “By Others”. Those operations will be conducted simultaneously with work under this Contract. Coordinate the work of the separate contractors with the work of this Contract, and cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. The Contractor shall include the work of the Owners separate contractor into the Project schedule.
1. Microwave oven
 2. All rough-ins, blocking at openings, power, etc. in preparation for the above referenced equipment is part of the work of this Contract (not the separate contract)
- E. The Contractor shall be responsible for correcting non-conforming concrete floor substrates (excessive moisture/humidity content, etc. adversely affecting the proper bonding of the finish flooring to the substrate) using materials compatible with the specified flooring systems and as approved by the flooring manufacturer. Such correction of non-conforming concrete floor substrates shall be made without additional cost or time added to the Construction Contract.
- F. For Contractors information, following this section is WWII Museum “Emergency Evacuation Plan and Evacuation Matrix”
- G. There are no Disadvantaged Business Enterprise requirements for this contract.
- H. Note: The building must be completely enclosed, including roof and watertight to prevent intrusion of rain before any drywall installation commences. Millwork, wood doors and finish materials shall not be installed until building is enclosed, either with permanent or temporary walls to remain until permanent walls are erected and watertight, including roof, and also the building is climatized by the building HVAC systems being operable or other temporary mechanical systems to maintain the dry bulb temperatures between 55 and 78 degrees F and relative humidity at less than 55 % during installation.
- I. The Contractor shall be responsible for correcting non-conforming concrete floor substrates (excessive moisture/humidity content, etc. adversely affecting the proper bonding of the finish flooring to the substrate) using materials compatible with the specified flooring systems and as approved by the flooring manufacturer. Such correction of non-conforming concrete floor substrates shall be made without additional cost or time added to the Construction Contract

1.04 EXISTING CONDITIONS

- A. The Contractor shall accept the area of the work in it's present condition and carefully examine the area of the work and determine for himself all existing conditions visually discernable and/or reasonably expected from his understanding of the Construction Documents and/or reasonably inferrible from the Contract Documents or his particular knowledge of this particular type of project, and shall be responsible for same. No activity by the Contractor shall jeopardize the usefulness of the existing building to the Owner at any time during the construction period.

1.05 CONTRACTOR'S USE OF PREMISES

- A. Confine operations at site to areas within the limits of the work of this Contract.

- 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 the Owner.
- F. Obtain and pay for use of additional storage or work areas needed for operation.

1.06 INTERPRETATION OF DOCUMENTS

- A. The Contractor shall notify the Architect of any ambiguity, inconsistency or error which he may discover upon examination of the Construction Documents or of the site and local conditions. If the Contractor performs any work knowing it to be contrary to applicable laws, ordinances rules and regulations, and without such notice to the Architect, he shall assume full responsibility therefore and shall bear all costs attributable thereto.
- B. During construction the "Request For Information" form, a copy following this section, shall be completed and submitted to the Architect to obtain a response to any needed information and/or clarifications.
- C. Should there be any discrepancy within information on the drawings and information within the specifications, between information on the drawings and information in the specifications and/or between information within the drawings the Architect, whose decision is final, will decide which information and requirement shall govern, and such could be the more stringent and more expensive requirement. Contractor to provide at no additional cost to the Owner

1.07 CONTRACTORS REPRESENTATIONS

- A. The Contractor represents that he has visited the site and determined for himself all existing conditions, laws and regulations that will affect the construction of the work and be responsible for same.
- B. The contractor must be fully qualified under any "Licensing Law for Contractors" in effect at the time and place of the work before submitting his proposal. In the State of Louisiana, only the bids of Contractors and Subcontractors duly licensed under Chapter 24 of the Louisiana State Legislature, La. R.S. 37:2151, et seq., will be considered if licensing is required. The law requires the Contractor to ascertain that his Subcontractors are fully licensed in accordance with the law.
- C. The Contractor represents that the contract will include the cost of the building permit, and all other permits and licenses, required as a result of the work of this Contract such as State Fire Marshal Plan Review Fee and also the local city review fees, as well as fees for inspection and testing as required by the City, Parish, or State authority having jurisdiction over this project..
 - 1. Contractor is responsible for submitting, paying for and securing the permit (projects in the City of New Orleans) for the installation, alteration or addition to fire protective signaling, detection or suppression systems. The permit shall be submitted to the Department of Fire, City of New Orleans, Fire Prevention Division, 317 Decatur Street,

New Orleans, LA 70130 in a timely manner since the Use and Occupancy permit is contingent on this permit.

2. Contractor is responsible to provide the Traffic Sidewalk Closure permit
 3. The documents have been submitted to the State Fire Marshal and also the City for review and permitting. **The Contractor shall secure the permit and pay the City for review and building permit cost.** The Contractor is responsible for picking up the permit when available.
- D. The Contractor represents that the Contract will include all applicable taxes; local, state, and federal.
- E. The Contractor represents that he has ascertained prior to submission of his bid that he has received all addenda issued, and that his contract will contain the costs associated with these addenda.

1.08 SUPERINTENDENT

- A. Contractor shall, prior to the commencement of construction operations, submit to the Architect for approval the name of the Superintendent and assistants he proposes to assign to the job and shall further submit a resume of the experience of the Superintendent and assistants and such other data as will attest to their competence and qualifications. This information shall be submitted in duplicate for the guidance of the Architect and Owner, and assignment of a Superintendent to the job shall not be made until the Owner and the Architect have approved this selection.
- B. The Superintendent shall be full time and be in attendance at the site whenever Work is being performed.

1.09 MATERIALS AND EQUIPMENT DELIVERY DATES

- A. The Contractor shall submit a statement giving a firm shipping and delivery date on all major items of building material and equipment. The statement shall be submitted not later than six weeks from the date the contract is returned to the Contractor.
- B. In addition, submit the names of the manufacturers of any long lead items that would potentially impact the progress of the Work and is the Contractor's responsibility to identify these manufacturers. Unless the aforementioned information is submitted, no extensions of time will be considered if extenuating circumstances exist affecting timely product delivery. Furthermore, no payments will be made to the Contractor until all information is furnished.

1.10 WORKING CONDITIONS AND SCHEDULING

- A. In general, the work may be performed during normal hours.
- B. The Contractor shall furnish sufficient forces, construction plant and equipment, and shall work such hours of overtime or perform a continuous operation if necessary to insure the prosecution of the work in accordance with the approved progress schedule. It is imperative that the Work be completed on or before the date scheduled, and necessary allowances shall be made in estimating the project to allow for the construction schedule. The Contractor shall "accelerate" his subcontractors to the fullest extent and he shall impress upon his subcontractors the expedience required to overcome delays on their part or in the delivery of materials. He shall be alert to any and all happenings that affect the progress of the project. If

the Contractor should fall behind in the progress schedule, it is mandatory that he take immediate steps, whatever required, to put the project back on schedule. Neither the Contractor nor any of his subcontractors nor anyone working on the Project shall be entitled to any compensation whatsoever for acceleration of the work for any reason for which the Contractor or any of his subcontractors or anyone else working on the Project is responsible, even if that responsibility is only a partial cause of the need to accelerate.

- C. The buildings and areas adjacent to the work areas will be in use by the public during the construction time and all protections for the public and property shall be implemented.
- D. All trash removal from the jobsite will be the responsibility of the Contractor. .
- E. Smoking is not allowed in the Buildings or the roof areas. Violation of this provision will cause expulsion of employee.
- F. Each contractor and subcontractor will be responsible for the actions of their personnel. There will be no alcoholic beverages, glass containers, or any “controlled substance” on the premises.
- G. A “One Strike” rule shall be followed and any person reported to the Owner for rude or lewd behavior will be ejected from the job and prohibited from working at WWII Museum site.
- H. The contractor and any subcontractors are required to coordinate their use of areas with Building Management so that normal building operations are not adversely affected by the construction activity.
- I. Media/social networking posts need to be cleared by the Museum
- J. Parking is available under the elevated expressway from Prytania St. to St Charles Avenue at no cost to the Contractor. A tag will be issued to hang from the rear view mirror for identification purposes . No work trucks will be allowed in the Parking Garage due to size and clearance issues.

1.13 PROTECTION OF PROPERTY AND PUBLIC

- A. Contractor shall protect Owner's existing property that is adjacent to the Work being performed under this contract. Contractor shall also obtain approval from the Architect prior to removal of protection. Prior to commencing work, the Contractor shall provide adequate protection such as covers, dust partitions, platforms, scaffolding, etc., all as may be necessary to protect the Owner's property from dust and possible falling debris and/or materials. Removal of such protection shall likewise be performed with extreme care to prevent possible damage to the Owner's property.
- B. Furthermore, the Contractor shall repair at his own cost and make good all damage to the Owner's property and to adjacent and adjoining properties not belonging to the Owner for which he is or has been adjudged to be legally responsible. He shall further, reimburse the Owner and/or Architect in full for any damages resulting from suits that may be decided against the Owner and/or Architect rising out of claims for property damage due to the Contractor's improper performance or negligence on the part of any of the Contractor's employees, agents, or subcontractors, or due to any other acts for which the Contractor is legally responsible, together with all attorneys' fees, cost of court, and any other expense that

may be entailed by the Owner and/or Architect in defending themselves against such suits and/or claims.

- C. The Contractor shall make all necessary provisions for the protection of the public and traffic and the use of streets and sidewalks. He shall provide barriers and shelters or any other safeguards as required to protect the public in accordance with the local laws. The safeguards and protections shall be fully maintained in first-class condition during the entire construction period, and at no time shall required protection be removed without the approval of the Architect. When required, provide all-night lights, lanterns, flares, etc. for night-time protection. All excavations shall be completely fenced in at all times.
- D. It is of utmost importance that all construction work be done without interfering with the normal operations of the adjacent areas and buildings.
- E. Restore all areas and items disturbed by the new construction to original condition.

1.14 CLEANLINESS AND CLEANUP

- A. All existing areas adjacent to the area of work must be kept clean from Contractor's debris. Any area not adequately cleaned by the Contractor shall be cleaned by the Owner (to his satisfaction) and the cost of such cleaning operations shall be deducted from any monies still due the Contractor.
- B. Clean the area on a daily basis.

1.15 DEFINITIONS AND EXPLANATIONS

- A. Scope: This article defines certain terms used in the specifications (Project Manual), and explains the language, abbreviations thereof, format and certain conventions used in the Specifications and associated Contract Documents.
- B. Limitations: The definitions and explanations of this article are not necessarily either complete or exclusive, but are general for the work to the extent such definitions or explanations are not stated more explicitly in another provision of the Contract Documents.
- C. General Explanation: A substantial amount of the Contract Document Specification language constitutes specific definitions for terms found in the other contract documents, including the drawings which must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon. Certain terms used repetitiously in the Contract Documents are defined generally in this article.
- D. General Requirements: The provisions and requirements of the performance of the work, either exclusively or in conjunction with others performing other work as part of the project.
- E. Definitions:
 - 1. Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing other work as part of the project.

2. Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for the intended use, as applicable in each instance.
 3. Project Manual: Includes the bidding requirements, Conditions of the Contract, and the Specifications (Division 1 through 16).
 4. Related Work Specified Elsewhere: List of items under this heading in the Specifications is for convenience only and is not intended to be all-inclusive or all-exclusive, nor to the direct specific trades to perform specific work.
- F. Format Explanation: The format of principal portions of these specifications can be described as follows; although other portions may not fully comply and no particular significance will be attached to such compliance or non-compliance:
1. Sections and Divisions: For convenience, the basic unit of specification text is a "section", each unit of which is named and numbered. These are organized into related families of sections, and the various families of sections are organized into "divisions", which are recognized as the present industry-consensus on uniform organization and sequencing of specifications. The section title is not intended to limit the meaning or content of the section, nor to be fully descriptive of the requirements specified therein, nor to be an integral part of the next.
 2. Parts: Each section of specification has been subdivided into 3 (or less) "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These do not limit the meaning of, and are not an integral part of, the text which specifies requirements.
 3. Underscoring: Used strictly to assist the reader of specification text in scanning the text for key words in the content (for quick recall). No emphasis on or relative importance of text is intended where underscoring is used.
 4. Section Numbering: Sections are numbered in CSI 5 Digit System. Contract Documents sections are placed in the Project Manual in numerical sequence; however, the numbering sequence is not complete, and the listing of sections in the Project Manual must be consulted to determine the numbers and names of specification sections in the contract documents.
 5. Page Numbering: Numbered independently for each section.
- G. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes 2 different or conflicting minimums or levels of quality, the most stringent requirement (which is generally recognized to be also the most costly) is intended and will be enforced, unless specifically detailed language written into the Contract Documents (not by way of reference to an industry standard) clearly indicates that the less stringent requirement is to be fulfilled. Refer apparently equal, but different requirements and uncertainties, as to which of 2 levels of quality is the more stringent, to the Consultant for a decision before proceeding.
- H. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended as the minimum for the work to be performed or provided.
- I. Specialists; Assignments: In certain instances the specification text requires (or at least implies) that specific work be assigned to certain specialists or expert entities, who must be engaged for the performance of those units of work.

- J. Abbreviations: The language of the specifications and elsewhere in the Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted.

END OF SECTION

Project: [Project Name - Line 1
Project Name - Line 2
Address – Line 3
Address – Line 4
City, State, Zip – Line 5
GLC No or other identifier – Line 6
Engage No. Sxxxx or other identifier – Line 7
MBA Project No. [xxxxx]

Date: [Month Day, Year]

Subject: REQUEST FOR INFORMATION

To: [Mathes Brierre Architects
Phone: [504-586-9303]

From: [General Contractor Information
Phone: [xxx-xxx-xxxx]

Attn: []
Copy: []

RFI Number: [xx]
RFI Title: [Short Title]

References: []

Description of Request for Information in Detail:

[]

MBA Response:

[]

Response by: []
Response date: []

This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order must be executed in accordance with the Contract Documents.

END of Request for Information

ALTERNATES**SECTION 01030****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Administrative and procedural requirements for Alternates.
- B. Documentation of changes to Contract Sum/Price and Contract Time (if applicable).

1.02 REQUIREMENTS

- A. An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that modifies to the Base Bid amount if the owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates are additive type, unless otherwise indicated, and if accepted, will be added to the base bid amount.
 - 2. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
- B. Alternates may be accepted in any order as long it does not affect the determination of the low bidder per LA R.S. 38:2212.J. Accepted alternates will be identified in the Owner-Contractor agreement.
- C. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- D. Coordinate related work and modify affected surrounding work as necessary to integrate the work of each Alternate completely and fully into the project.
- E. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not specifically mentioned as part of the Alternate.
- F. Execute accepted alternates under the same conditions as other Work of this Contract.

1.03 SCHEDULE OF ALTERNATES

- A. Alternate No. 1:** Added cost to furnish and install one (1) VLM unit as specified in Section 11100-VLM Units and as indicated on the drawings.
Base bid includes all utilities required for the unit.
- B. Alternate No. 2:** Added cost to furnish and install track heads type TA and TC for ceiling tracks T1A and T1B in the Macro Exhibit areas.
Base bid includes installation of all ceiling track (T1A/T1B), circuitry and controls for future installation of the track heads into the track. The wall track (T2) and heads fixture type TB are also base bid.
- C. Alternate No. 3:** Added cost to furnish and install terrazzo flooring as shown on the drawings and as follows and specified in Section 09400. Base bid shall be resinous flooring as specified in Section 09670. Stainless steel base applies to the base bid and the alternate.
Locations:
Entrance Lobby, including steps and ramp, restroom vestibule, elevator vestibule
Level 2 Lobby, including elevator vestibule

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

CUTTING AND PATCHING**SECTION 01040****PART 1 - GENERAL****1.01 SUMMARY OF WORK**

- A. Furnish all labor materials, tools, and equipment, and perform all operations necessary for cutting and patching work indicated or specified. The work involved in this section includes the following:
 - 1. Cutting and patching of existing construction to accommodate the new Work.
 - 2. Any cutting of fire rated construction i.e. walls, floors, chases, etc., shall be patched with same construction or equivalent firestopping materials to maintain the existing fire rating.
 - 3. Firestopping of all existing openings in fire rated construction, i.e. walls, floors, chases, etc. within the area of work. Existing openings must be field verified by the Contractor.
 - 4. Comply with Section 07270 for firestopping materials and installations.
 - 5. Filling holes in existing masonry walls with new masonry
- B. "Cutting-and-Patching" is hereby defined to include but is not necessarily limited to the cutting and patching of nominally completed and previously existing work, in order to accommodate the coordination of the work, or to uncover other work for access or inspection, or to obtain samples for testing, or for similar purposes.

1.02 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required. Show how it will be performed and 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. List products to be used and firms or entities that will perform work.
 - 4. Indicate dates when cutting and patching will be performed.
 - 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

1.03 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.

- B. Visual Requirements: Cut-and-patch work in a manner which will not result in a reduction of visual qualities or in substantial evidence of the cut-and-patch work, both as judged solely by the Architect. Remove and replace work judged by the Architect to be cut-and-patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Except as otherwise indicated or approved by the Architect provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Use the original materials where feasible and where recognized that satisfactory results can be produced thereby.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: 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.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. 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.

3.02 CUTTING AND PATCHING

- A. General: Employ skilled tradesmen to perform cutting-and-patching. Except as otherwise indicated or approved by the Architect, proceed with cutting-and-patching at the earliest feasible time, in each instance, and perform the work promptly.
 - 1. 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.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

3.03 MASONRY REBUILDING

- A. Lay masonry with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing.
- F. Tool mortar joints in repaired areas to match joints in size and color of surrounding existing masonry units.
- G. Mortar shall comply with ASTM C270, Type S utilizing the Proportion Method to achieve 1800 psi strength.

END OF SECTION

PROJECT MEETINGS**SECTION 01200****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference
 - 2. Pre-Installation Conferences
 - 3. Coordination Meetings
 - 4. Progress Meetings
- B. The Architect shall schedule, conduct and record the contents of all meetings and distribute typed minutes to all pertinent parties in a timely manner.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule.
 - 2. Critical Work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Distribution of Contract Documents.
 - 7. Submittal of Shop Drawings, Product Data and Samples.
 - 8. Preparation of record documents.
 - 9. Use of the premises.
 - 10. Office, Work, and storage area.
 - 11. Equipment deliveries and priorities.
 - 12. Safety procedures.
 - 13. First aid.
 - 14. Security.
 - 15. Housekeeping.

16. Working hours.
 17. Establish timing of progress meetings to coincide with monthly pay request.
- D. Submittals: Contractor will be responsible for submitting the following at the pre-construction conference:
1. Schedule of values
 2. List of major subcontractors
 3. Tentative construction schedule
 4. Critical work sequencing

1.04 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of schedule meeting dates.
- B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
1. Contract Documents
 2. Options
 3. Related Change Orders
 4. Purchases
 5. Deliveries
 6. Shop Drawings, Product Data and quality control samples
 7. Possible conflicts
 8. Compatibility problems
 9. Time schedules
 10. Weather limitations
 11. Manufacturer's recommendations
 12. Compatibility of materials
 13. Acceptability of substrates
 14. Temporary facilities
 15. Space and access limitations
 16. Governing regulations
 17. Safety
 18. Inspection and testing requirements
 19. Required performance results
 20. Recording requirements
 21. Protection
- C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.
- D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.05 COORDINATION MEETINGS

- A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and shall address similar agenda items as the Progress Meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.06 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Architect, Contractor and his Superintendent each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project to include applicable agenda items listed for the Pre-Construction Conference and as further listed below.
- D. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- E. Review the present and future needs of each entity present, including such items as:
 - 1. Interface requirements
 - 2. Time
 - 3. Sequences
 - 4. Deliveries
 - 5. Off-site fabrication problems
 - 6. Access
 - 7. Site utilization
 - 8. Temporary facilities and services
 - 9. Hours of work
 - 10. Hazards and risks
 - 11. Housekeeping

12. Quality and Work standards
 13. Change Orders
 14. Documentation of information for payment requests
- F. Reporting: No later than three (3) days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- G. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION

PAYMENT PROCEDURES**SECTION 01290****PART 1 – GENERAL****1.1 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Application for Payment. Note: See lien waiver forms following this section

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.
 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Submit draft of AIA Document G703 Continuation Sheets.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion~ and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the 30th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit waivers of lien on forms following this section entitled "Contractor Release and Waiver, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors. Submit at Pre-Construction Conference.
 2. Schedule of Values. Submit at Pre-Construction Conference
 3. Contractor's Construction Schedule (preliminary if not final). Due 5 days after Award of Bid, but no later than the Pre-Construction Conference.
 4. Schedule of unit prices. Submit at Pre-Construction Conference.
 5. Submittals Schedule (preliminary if not final). Due 5 days after Award of Bid, but no later than the Pre-Construction Conference
 6. List of Contractor's staff assignments. Due 5 days after Award of Bid.
 7. Initial progress report. Due with first Application for Payment.
 8. Report of preconstruction conference. Due with first Application for Payment.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion on, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final, liquidated damages settlement statement.
 9. Prior to final payment (retainage) being released by the Owner, the Contractor must secure and provide the Owner with a unrestricted Use and Occupancy Certificate.

PART 2- PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION 01290

SUBMITTALS**SECTION 01300****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Submittal schedule and procedures.
- B. Construction progress schedule. Contractor to provide scheduling data files
- C. Proposed products list.
- D. Daily construction reports.
- E. List of Subcontractors.
- F. Shop drawings.
- G. Product data.
- H. Samples.
- I. Manufacturer's instructions.
- J. Manufacturer's certificates.
- K. Schedule of values.

1.02 RELATED SECTIONS

- A. Section 01700 - Project Closeout

1.03 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the work will be judged.
- C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not samples.

1.04 SUBMITTAL SCHEDULE

- A. General: Immediately following the development and acceptance of the fully developed progress schedule, prepare a complete Submitted Schedule of work-related submittals. Correlate submittal schedule with the requirements of Division 2 through 16.

- B. Form: Prepare schedule in chronological sequence of submittals related to dates required for the items on the site. Indicate generic description of work covered including type of submittal, related specification section numbers, name of subcontractor/vendor and required date for item to be delivered on the site. The Schedule shall contain all submittals required including shop drawings (SD), product data (PD) and samples (S). Columns for date of submittal to Architect and Architect to Contractor, resubmittal, and final release by the Architect shall be left blank for use by the Architect.
1. See the "Sample" Submittal Schedule following this Section, which represents the format to be used for development of the Schedule.
 2. The above Schedule will serve as a summary of work related submittal and will be used by the Architect as a submittal log.

1.05 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
- B. Submission Requirements: Submit samples in number and size specified in each Specification Section. Accompany submittals with transmittal letter, in duplicate, containing the following:
1. Date.
 2. Project Title and Number.
 3. Contractor's Name and Address.
 4. The number of each Shop Drawing, Project Datum and Sample submitted.
 5. Notification of deviations from Contract Documents.
 6. Other pertinent data.
 7. NOTE: Each individual transmittal shall only contain submittals for a single specification division, i.e. do not submit division 3 items together with division 4 items on the same transmittal.
- C. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4 by 6 inches on the label or beside the title block on shop drawings to record the Contractor's and Architect's review markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate specification section.
 - i. Drawing number and detail references, as appropriate.
 - j. Identification of product or material.

- k. Relation to adjacent structure or materials.
 - l. Field dimensions, clearly identified as such.
 - m. Application standards, such as ASTM number or Federal Specification.
 - n. Identification of deviation from Contract Documents (if any).
 - o. Contractor's stamp, initialed certifying to review of submittal, verification of field measurements and compliance with Contract Documents.
- D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.
 - 1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 - 2. Transmittal Form: Use the "round-robin" form at the end of this Section for transmittal of submittals.
- E. Sequentially number the transmittal forms. Resubmittals shall have original number with an alphabetic suffix.
- F. Identify Project, Contractor, subcontractor or supplier; pertinent drawing sheet and detail number(s), and specification section number.
- G. Contractor shall review all submittals. Apply Contractor's stamp, signed, or initialed certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- H. Schedule submittals to expedite the Project, and deliver to Architect at Architect's business address. Coordinate submission of related items.
- I. Contractor shall identify deviations from Contract Documents in writing and/or indicate on the submittal and on the submitted transmittal noting "Deviation". Also provide product or system limitations which may be detrimental to successful performance of the completed Work.
 - 1. If items, dimensions or methods submitted deviate from the Contract Documents and action is not taken by the Architect or his Consultants, this action and the deviation shall not alter the Contract sum.
- J. It is the Contractor's responsibility to submit revised details and coordinate any necessary changes in related work when the dimensions and configuration of original details (Contract Documents) are altered by substitutions of materials according to provisions for substitutions contained in the Contract Documents and/or any deviations submitted.
- K. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- L. Begin no work which requires submittals until submittals are received with Architects/Engineers stamp and initial indicating review and final unrestricted release. Distribute

copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.06 ARCHITECT'S REVIEW

- A. The Architect will review submittals only for the limited purpose of checking conformance with the design concept of the project and with the information given in the Contract Documents. Review of a separate item shall not indicate approval of an assembly in which the item functions or any other related assembly.
- B. The Architect's review shall not relieve the Contractor from responsibility for errors or omissions in the submittals.
- C. The Architect's review shall not constitute approval of safety precautions or unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures.
- D. The Architect's action on the stamp does not constitute acceptance of any deviations. If deviations are accepted the contract price shall not increase.
- E. Action Stamp: The architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Where submittals are marked "Do Not Resubmit", that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. Final-But-Restricted Release: When submittals are marked "Reviewed" and "Noted", that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 3. Returned for Resubmittal: When submittal is marked "Resubmit As Noted" or "Rejected", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

1.07 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Architect at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Accidents and unusual events.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, and losses.
 - 7. Meter readings and similar recordings.
 - 8. Emergency procedures.

9. Orders and requests of governing authorities.
10. Change Orders received, implemented.
11. Services connected, disconnected.
12. Equipment or system tests and start ups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized.

1.08 CONSTRUCTION PROGRESS SCHEDULES

- A. Schedule: Prepare a fully developed CPM (Critical Path Method equal to Primavera, Microsoft Projects, etc.) construction schedule in horizontal bar-chart format, to include submittal schedule, critical path items (critical remaining work) all activities linked by predecessors and successors and milestones, and other items listed below.
 1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the "Schedule of Values".
 2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate actual completion.
 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, or sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the work.
 5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner.
- C. Phasing: On the schedule, show how requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner affect the sequence of work.
- D. Work Stages: Indicate important stages of construction for each major portion of the work, including submittal review, testing, and installation.
- E. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.

- F. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of work performed as of the dates used for preparation of payment requests.
- G. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the project meeting room and temporary field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.
- H. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.09 PROPOSED PRODUCTS LIST

- A. In addition, submit the names of the manufacturers of any long lead items that would potentially impact the progress of the Work and is the Contractor's responsibility to identify these manufacturers. Unless the aforementioned information is submitted, no extensions of time will be considered if extenuating circumstances exist affecting timely product delivery. Furthermore, no payments will be made to the Contractor unless all information is furnished.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.10 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- B. Review of shop drawings by the Architect will be for general compliance with Contract Documents. No responsibility will be assumed by the Architect for correctness of dimensions, quantities or details. The Contractor shall check and verify all field measurements. The Contractor and each separate Contractor shall submit with such promptness as to cause no delay in their own work or in that of any other Contractor, shop or setting drawings, and schedules required for the work of the various trades.
- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
 - 6. Indicate deviations from the Contract Documents.

- D. Initial Submittal: The first submittal of shop drawings to the Architect for review shall be electronic pdf file.
 - 1. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit shop drawings on sheets at least 8 $\frac{1}{2}$ " x 11" but no larger than 36 by 48 inches. If drawings require more than one 24" x 30" size sheet multiple 8 $\frac{1}{2}$ " x 11" size drawings are not acceptable and will be returned for incorporating into a larger sheet.
- E. Final Submittal: The pdf (with corrections marked thereon and stamped) will be returned to the Contractor. A subsequent pdf and print shall be resubmitted by the Contractor after correcting the original tracing, until the pdf is stamped by the Architect "No Exceptions Taken", the Contractor shall resubmit final pdf.
- F. Maintain one set of shop drawings at the project site, available for reference by the Architect, Engineer or others.
- G. After review, reproduce and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.11 PRODUCT DATA

- A. Collect and submit all required data into one submittal for each material, product or system; and mark each copy to show which choices and options are applicable to the project. Include manufacturer's standard printed recommendations for specific application and use for this project, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data at the project site, available for reference by the architect, Engineer or others.
 - 1. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer' standard data to provide information unique to this Project. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information only. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Submit electronic pdf of each required submittal. The Architect will mark with action taken and corrections or modifications required.
 - 1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.12 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection, or where indicated as "custom", submit in custom color indicated.
- C. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
- D. All such samples, colors, etc. shall be submitted in one complete package to facilitate Architects review of related materials and colors. Each sample and color grouping shall be properly labeled with project name, Architect's job number, and applicable specification section number.

1.13 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. The Contractor is responsible to furnish and install equipment in accordance with manufacturer's instructions and more stringent requirements when specified. If manufacturer's instructions deviate or conflict with the Contract Documents, the Contractor shall identify conflict to the Architect prior to procuring or installing equipment.

1.14 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Architect/Engineer for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceed specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on materials or Product, but must be acceptable to Architect/Engineer.

1.15 SCHEDULE OF VALUES

- A. In accordance with General Conditions. Correlate line items with other administrative schedules and forms required for the Work, including progress payment request forms (AIA Forms G703 and G702). Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Submit three (3) copies of Schedule of Values to Architect and as follows:
 - 1. Submit at Pre-Construction Conference.
 - 2. Use the Index of this Specification as the format for listing costs of work for Sections under Division 1 through 16. Use each Section number under each Division. Each

- section shall be subdivided into separate line items for the total cost (with overhead and profit) of separate items in Section.
3. Round off cost figures to the nearest ten (10) dollars. The total of all items shall equal the total Contract Sum.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

ROUTING TRANSMITTAL

Architects Contact: _____
 General Contr. Contact: _____
 Mechanical Contact: _____
 Electrical Contact: _____

PROJECT: _____

 PROJECT NO.: _____
 SUBMITTAL NO: _____

TO	FROM	SENT	RECEIVED
MATHES BRIERRE ARCHITECTS			
	MATHES BRIERRE ARCHITECTS		

Enclosed please find the following: _____

Drawings Prepared By:	Copies:	Drawing No. or Title:	Resubmit	Do Not Resubmit	Resubmit As Noted	Reviewed	Noted	Rejected

REMARKS:

Architect's review is for conformity to the design concept and for general arrangement only in accordance with the general conditions of the contract:

1. Reviewed: work may proceed.
2. Noted: work may proceed as noted – resubmit corrected drawing.
3. Resubmit: Correct and resubmit drawing before proceeding.
4. Rejected.
5. Do not resubmit.
6. Resubmittals noted.

Architect's review is for conformity to the design concept and for general arrangement only in accordance with the general conditions of the contract:

1. Reviewed: work may proceed.
2. Noted: work may proceed as noted – resubmit corrected drawing.
3. Resubmit: Correct and resubmit drawing before proceeding.
4. Rejected.
5. Do not resubmit.
6. Resubmittals noted.

PROCEDURES AND QUALITY CONTROL**SECTION 01400****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 ADMINISTRATION

- A. Coordination: Coordinate various elements of the work and entities engaged to perform work; and coordinate the work with existing facilities/conditions, and with work by separate contractors (if any) and Owner.
- B. Project Meetings: Conduct general progress and coordination meetings at least once each month, attended by a representative of each primary entity engaged for performance of work. Record discussions and decisions, and distribute copies to those attending and others affected including the Architect. Schedule meetings to coordinate with preparation of payment requests.
 - 1. See Section 01200 - Project Meetings.

1.04 SUBMITTAL SCHEDULE

- A. General: Immediately following the development and acceptance of the fully developed progress schedule, prepare a complete schedule of work-related submittals. Submit within ten (10) days of date required for establishment of the progress schedule. Correlate submittal schedule with the listing of principal subcontractors. Refer to Section 01300 and Division 2 through 16 for submittal requirements.
- B. Form: Prepare schedule in chronological sequence of "first submittals". Show category of submittal, name of subcontractor, generic description of work covered, related Specification section numbers, activity or event number on progress schedule, scheduled date for first submission, and blank columns for actual date of submittal, resubmittal, and final release by the Architect.

1.05 SURVEYING/RECORDING

- A. General: Working from established lines and levels at or near project site, establish and maintain dependable markers for lines and levels of the Work, including markers for each story of construction and elsewhere on the site as needed to properly locate construction and elsewhere on the site as needed to properly locate each element of the entire project. Calculate dimensions and measure for layout of work; do not scale the Drawings. Maintain surveyor's log of layout work. Record deviations (if any) from drawings information on existing conditions, and review with Architect at time of discovery.
 - 1. The Contractor shall retain a competent registered professional engineer or registered land surveyor, acceptable to the Owner and Architect, who shall establish the exterior lines building corners, first floor slabs and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the

construction of associated work such as, but not limited to, roads, utilities, and site grading. The engineer or land surveyor shall certify the actual location of the constructed facilities in relation to the property lines, building lines, easements, and other restrictive boundaries.

2. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.
 3. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.
 - a. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.
 4. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 5. Final Property Survey: Prepare a final property survey showing significant features (real property) and ground floor elevation for the project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, elevations and levels of the project are accurately positioned as shown on the survey.
 - a. Recording: At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".
 - b. Above survey shall be provided by a registered surveyor as qualified herein
- B. Progress Photographs: During construction, photograph the work in progress from vantage points selected by Architect.
1. Quality: digital images.
 2. Quantity: Photograph project once each month; and take a minimum of ten (10) shots each time, except take twenty (20) shots at time of substantial completion. Contractor should take digital photos of all existing conditions (streets, curbs, paving, driveways, sidewalks, fence, gates, trees, etc...). and submit with first Pay application

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Receive, store and handle products, materials and equipment in manner which will prevent loss, deterioration and damage. Schedule deliveries to minimize long-term storage at project site. See Specification sections for specific requirements.

1.06 WARRANTIES (GUARANTEES)

- A. Categories of warranties required for the work include: 1) Special project warranty (guarantee), issued by Contractor and, where required, countersigned by Installer or other

recognized entity involved in performance of the work, 2) Specified product warranty, issued by manufacturer or fabricator, for compliance with requirements in Contract Documents, and 3) Coincidental product warranty, available on a product incorporated into the Work, by virtue of manufacturer's publication or warranty without regard for application requirements (non-specified warranty). Refer to sections of Divisions 2 through 16 for requirements of specified warranties.

- B. **Warranty Obligations:** Restore or remove-and-replace warranted work to its originally specified condition, at such time during warranty as it does not comply with or fulfill terms of warranty. Restore or remove-and-replace other work which has been damaged by failure of warranted work, or which must be removed and replaced to gain access to warranted work. Cost of restoration or removal-and-replacement is Contractor's obligation, without regard to whether Owner has already benefitted from use of failing work.
 - 1. **Reinstatement of Warranty:** Upon restoration or removal-and-replacement of warranted work which has failed, reinstate the warranty by issuing newly executed form, for at least the remaining period of time of the original warranty, but for not less than half of the original warranty period.
- C. **Owner's Recourse:** Warranties and warranty periods do not diminish implied warranties, and do not deprive Owner of actions, rights and remedies otherwise available for Contractor's failure to fulfill requirements of the contract documents. Owner reserves right to reject coincidental product warranties considered to be conflicting with or detracting from requirements of the contract documents.

1.07 INSPECTIONS AND TESTING

- A. **General:** Neither inspection-and-test results nor failure thereof to disclose deficiencies relieves Contractor of responsibility to comply with requirements of Contract Documents. Provide services to inspection and testing agencies (Owner's and Contractor's), including taking and delivery of samples, patching work and similar assistance. Require engaged agencies to perform indicated testing and submit reports promptly; and to report significant observations having an important bearing on the work, to the Architect by the most expeditious means possible.
 - 1. See Section 01410 - Testing Laboratory Services
- B. **Installer Inspections:** Require Installer of each major unit of work to inspect substrate and conditions for installation, and to report (in writing) unsatisfactory conditions. Correct unsatisfactory conditions before proceeding. Inspect each product immediately before installation, and do not install damaged or defective products, materials or equipment.

1.08 PREPARATIONS FOR INSTALLATION

- A. **Pre-Installation Conference:** Prior to starting installation of each major component of the Work, hold a pre-installation conference, attended by each entity involved or affected by planned installation. Include technical representatives of product manufacturers and other recognized as expert or otherwise capable of influencing success of the installation. Review significant aspects of requirements for the Work. Record discussion and distribute as plan of action.

1.09 INSTALLATION, GENERAL

- A. Examination of Substrate and Conditions: Examine the substrate and the conditions under which work is to be performed. If unsatisfactory conditions are found, do not proceed with the work until these conditions have been corrected and placed in a condition recommended by the manufacturer of the items to be installed.
- B. Comply with manufacturer's printed instructions and recommendations to extent printed information is more detailed or stringent than requirements contained directly in Contract Documents.
- C. Timing: Install work during time and under conditions which will ensure best possible results, coordinated with required inspection and testing.
- D. Anchor work securely in place, properly located by measured line and level, organized for best possible uniformity, visual effect, operational efficiency, durability, and similar benefit to Owner's use. Isolate non-compatible materials from contact, sufficiently to prevent deterioration.
- E. Mount individual units of work at industry-recognized mounting heights, if not otherwise indicated; refer uncertainties to Architect before proceeding.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that the installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Architect.
 - 1. Maintain one set of complete instructions at the job site.
- B. Handle, prepare substrate, install, connect, clean, and adjust products in strict accordance with such instructions and in conformity with specified requirements.
- C. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
- D. Do not proceed with work without clear instructions.

1.11 CLEANING AND PROTECTION

- A. General: Clean each element of work at time of installation. Provide sufficient maintenance and protection during construction to ensure freedom from damage and deterioration at time of substantial completion.
 - 1. See Section 01700 - Project Closeout

1.12 DEFINITIONS

- A. General: In addition to the definitions in the General and Supplementary Conditions and other locations in the Contract Documents, add the following:

1. Provide: Furnishing of all labor and materials, equipment, transportation, installation and services required, directly or indirectly.
2. Project Manual: Includes the bidding requirements, Conditions of the Contract, and the Specifications (Division 1 through 16).
3. Related Work Specified Elsewhere: List of items under this heading in the Specifications is for convenience only and is not intended to be all-inclusive or all-exclusive, nor to the direct specific trades to perform specific work.

1.13 REFERENCE STANDARDS

- A. General: Any reference to standards (such as ASTM, Federal Specifications, etc.), where the date is not specified, shall mean the latest edition of such standards published prior to the date of the Contract Documents. Where such a reference is made, the applicable standard is hereby made a part of the specification which refers to it to the same extent as if written out in that specification in full.

1.14 SCHEDULE OF VALUES

- A. At the Pre-Construction Conference, the Contractor shall submit to the Architect a Schedule of values prepared as follows:
 1. The Schedule of Values Form of submittal shall be AIA Document G702A, Continuation Sheet.
 2. Use the Index of this Specification as the format for listing costs of work for Sections under Division 1 through 16. Use each Section number under each Division of r subtitles. Each section shall be subdivided into separate line items for the total cost (with overhead and profit) of separate items in Section.
 3. Round off cost figures to the nearest ten (10) dollars. The total of all items shall equal the total Contract Sum.

1.15 COORDINATION

- A. The Contractor is responsible to coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operation.
 1. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notes, reports and attendance at meetings.
 1. Prepare similar memoranda for the Owner regarding his separate Contractors where coordination of their work is required.

- C. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project close-out activities.
- D. Contractor shall coordinate the arrangements for all chases, openings, trenching, etc., required for the installation of the work under this contract and shall be held solely responsible for proper location of same.
- E. Where work will be installed in close proximity to other work of other trades, or where there is evidence that work will interfere with the work of the other, Contractor shall assist in resolving space conditions to make a satisfactory adjustment. If a subcontractor installs his work before coordinating with other trades, or cause interference with work of other trades, the Contractor shall implement necessary changes in the work to correct the condition without additional charge to the Owner.
- F. All questions regarding scope, cost, project schedule, or intent of the Documents shall be initiated with the Architect. The Contractor's performance of any Work at the direction of others, without the prior authorization of the Architect or another Owner's designated representative, will be at the Contractor's risk.
- G. The Contractor shall participate with all appropriate subcontractors for preparation of coordination drawings to be submitted to the Architect for review in accordance with Section 01300. These drawings shall clearly indicate all components of all trades (architectural, structural, plumbing, HVAC, fire protection, acoustical, electrical, etc.) whose installation must be coordinated in order to achieve the intent of the Contract Documents with specifics as follows. The drawings shall show all electrical and mechanical items installed in floors walls and ceilings, as well as locations of all valves, dampers, and other items requiring access for service and maintenance. The drawings shall also incorporate beams, columns, walls, acoustical treatment, floors, partitions, windows, doors and other major architectural and structural elements with dimensions

END OF SECTION

TESTING LABORATORY SERVICES**SECTION 01410****PART 1 - GENERAL****1.01 SELECTION AND PAYMENT:**

- A. The Owner will select and will pay for the services of an independent testing laboratory to perform inspections and test of materials and constructions as hereinafter specified and/or as specified in other sections of the specifications or as shown on the Drawings.

1.02 RELATED SECTIONS

- A. Section 02300 - Earthwork
- B. Division 2 - Piling
- C. Division 3 – Concrete and Precast Erection
- D. Division 5 - Steel
- E. Section 07255 - Sprayed on fireproofing

1.03 RESPONSIBILITY OF CONTRACTOR

- A. Selection of the laboratory by the Owner or failure of Owner to perform testing in no way relieves the Contractor of his responsibility to furnish materials and construction in full compliance with the project plans and specifications. The Contractor accepts all processes, materials and their use which are approved by the testing laboratory unless the Contractor protests in writing prior to the approval by the testing laboratory.

1.04 COOPERATION OF CONTRACTOR

- A. The Contractor shall cooperate with the laboratory and make available, without cost, samples of materials to be tested.
- B. Furnish such nominal labor and sheltered working space as is necessary to obtain samples at the project.
- C. Advise the laboratory of the identity of material sources and instruct the suppliers to allow tests or inspections by the laboratory.
- D. Notify the laboratory sufficiently in advance of operations to allow for completion of initial tests and assignment of inspection personnel. Notification shall be not less than 48 hours in advance or as directed by the Architect.

1.05 REJECTION OF MATERIALS

- A. The laboratory shall reject any materials which are not in full conformance with specifications, and promptly notify the Architect. The Architect shall notify the Contractor promptly of such rejections. Any materials rejected by the laboratory shall not be incorporated in the work without prior written approval of the Architect.

1.06 TEST METHODS

- A. Tests and inspections shall be conducted in accordance with the requirements of these specifications or, if not herein specified, in accordance with latest ASTM, ACI, or other recognized authorities.

1.07 TEST REPORTS

- A. The laboratory shall submit written reports of each test and inspection made to the Architect, Engineer and Contractor, suppliers of tested products and to such other parties the Architect may specify.

1.08 ADDITIONAL TESTS

- A. The Architect reserves the right to require additional tests to those specified or upon materials not herein specified for testing. If such tests are necessary because of apparently defective materials or workmanship, the cost of these additional tests shall be borne by the Contractor.

1.9 DESCRIPTION OF TESTS AND INSPECTION

- A. Piling: Inspect all piling for compliance with the specifications and stamp with seal of laboratory. Log the driving of probe piles, conduct pile load test and prepare report of load test. See Division 2 Section - Piling for additional requirements.
 - 1. All acceptable piles are to be hammer marked in the butt. Piles shall be reinspected immediately prior to driving by the laboratory's job site representative.
 - 2. Log the driving of all piles, recording the date driven, actual tip and butt dimension measured at time of driving, type of hammer, and driving resistance with the blows per foot for the full length of the pile. Submit driving records daily.
 - 3. Vibration Monitoring: During the driving of all piles, including exploratory piles (if any), the laboratory shall monitor and record the vibrations to adjacent building and surrounding areas. The laboratory shall employ the services of a vibration specialist engineer who in conjunction with the laboratory shall render complete reports and interpretations of the data obtained, including the possible effects of the measured vibrations on adjacent and surrounding structures. The vibrations shall be measured by means of a portable Seismograph which directly measures particle velocity (rate of ground movement) in three mutually perpendicular directions (longitudinal, transverse and vertical). Probes shall be located at various locations as required to achieve meaningful readings. An air blast monitor which measures the air pressure phenomena associated with the pile driving shall also be employed. In addition to daily reports, a complete report of the vibration study, including seismograms, shall be furnished after the conclusion of the driving of the exploratory piles (if any) and after driving all remaining piles.
- B. Concrete: The laboratory shall continuously monitor the delivery and placing of ready-mix concrete for compliance with the Drawings and the Specifications. The laboratory representative shall report any substandard concrete operations as soon as practicable. Laboratory shall comply with the requirements of ACI 301, Chapter 16.
 - 1. Mix Design: In advance of concrete operations, materials proposed for use in concrete shall be sampled and tested to determine their compliance with the Specifications. Mix proportions shall be established by the Contractor for each strength and type of concrete and shall submit same to Laboratory. Laboratory shall review mix designs for compliance with the Specifications.

2. Sampling: The laboratory shall test the slump, air content, and temperature of the discharged concrete periodically from trucks selected at random and from all truckloads exhibiting visible inconsistencies. The laboratory representative shall have the authority to reject any truckload of concrete not delivered within the specified time limit, or not in compliance with the slump or air-entrainment requirements, or otherwise judged to be deficient.
 3. Test cylinders: The laboratory shall cast a set of three (3) standard cylinders for each one hundred (100) cubic yards of concrete placed, but no less than one set per pour. The cylinders shall be broken in the laboratory to test the compressive strength; test one (1) at seven (7) days and two (2) at twenty-eight (28) days.
 4. Testing procedures shall be in accordance with the following:
 - a. Slump test, ASTM C143
 - b. Sampling, ASTM C172
 - c. Cylinder specimens, ASTM C31
 - d. Compression tests, ASTM C39
 - e. Criteria for acceptance, ACI 301 Chapter 17
 - f. Air content, ASTM C173 or C231
 - g. Obtaining and testing drilled cores and sawed beams of concrete, ASTM C42
 - h. Unit weight test, ASTM C138
 - i. Temperature of freshly mixed concrete, ASTM C1064
 5. No testing laboratory services will be required for concrete in structurally unsupported sidewalks.
- C. Soil Compaction: The Testing Laboratory shall obtain a sample of soil to be used as fill or backfill material and perform a sieve analysis test and a Moisture-Density Relation analysis per ASTM D698 or ASTM D1557 to determine optimum moisture content and maximum density in accordance with Section 02200 - Earthwork. If proposed fill material has more than 20% passing a number 200 sieve a complete soils classifications test shall be run per AASHTO M-145.
1. Fill under building structures and paving shall be analyzed for in place dry density and moisture content per ASTM D2922 and ASTM D3017. Test shall be taken no more than two days before placement of the next lift, slab or pavement. Fill must be retested if soil is heavily rained on after testing and before the next lift, pavement or slab is placed. Density tests shall be taken as follows:
 2. Backfill of trench over 18" deep and behind grade walls; one test per 150 linear feet per 24" of depth.
 3. Perform field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D2922 (nuclear method).
 4. Building Slab Subgrade: Make at least one (1) field density test of subgrade for every 5000 sq. ft. of building slab, but in no case less than four (4) tests.
 5. Paved Areas Subgrade: Make at least one (1) field density test of subgrade for every 4500 sq. ft. of paved area but in no case less than four (4) tests. The testing laboratory shall also determine base course thickness at each density test.
 6. Footing Subgrade: Visual inspection for type of soil and bearing capacity, and determining presence of loose materials.
- D. Reinforcing Steel: The laboratory shall check mill test reports and monitor the placing of all reinforcing steel for compliance with the Specifications.

- E. Structural Steel, Metal Deck and Steel Joists: The testing laboratory shall visually inspect all connections to determine quality, size, and compliance with reviewed erection drawings. Where the quality of a weld is in question, the Architect will be advised. The Contractor may then be required to remove and reweld the connection or if the Contractor desires, he may have the weld inspected further by radiography. The cost of this radiography inspection will be borne by the Contractor whether or not the weld is acceptable.
1. All welders shall be approved by the laboratory in accordance with American Welding Society Standards and qualified for the type of welding which they will perform. All field butt welds shall be witnessed by the laboratory while being welded. All field butt welds shall be ultrasonic tested.
 2. If high-strength bolts are used, the testing laboratory shall inspect the high-strength bolt connections in accordance with the requirements set forth in "Specifications for Structural Joints Using ASTM A325 Bolts", by the American Institute of Steel Construction.
- F. Grout: For every 5,000 sq. ft of wall area placed, grout strength shall be tested with a set of cubes in accordance with ASTM C1019.
- G. Precast Concrete Erection: The testing laboratory shall visually inspect all connections to determine quality, size and compliance with reviewed erection drawings. Where the quality of a weld is in question, the Architect shall be advised. The Contractor may then be required to remove and reweld the connection or, if the Contractor desires, he may have the weld tested by radiography or some other applicable AWS approved method of test meeting the approval of the testing laboratory and the Architect. The cost of this radiography inspection will be borne by the Contractor whether or not the weld is acceptable.
- H. Sprayed On Fireproofing: The testing laboratory shall sample and verify the thickness and density of the fireproofing in accordance with provisions of ASTM E605, "Standard Test methods for Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members", the "Inspection Procedure for Field Applied sprayed Fire Protection Materials" as published by the AWCI, or Uniform Building Code Standard No. 43-8 entitled "Thickness and Density Determination for Spray-Applied Fireproofing".
1. Test Frequencies: Perform non-destructive thickness measurements on 25 percent of each type of member. The remaining members shall be visually inspected for uniformity of application.
 2. Density Determination: Take random samples in the field and perform laboratory density determinations at the frequency of one test per 10,000 S.F. of floor area. Contractor shall reapply fireproofing material to replace samples taken by the laboratory.
 3. Bond Strength Tests: If the steel to be fireproofed is painted, the Testing Laboratory will perform tests to determine the bond strength of the proposed fireproofing material in accordance with ASTM E736. The bond strength tests will be performed on a test section of either the actual members in place on a mock-up erected at the project site. Bond strength testing shall be completed prior to the start of fireproofing application operations.
 4. Test Results: A written report of the results of the tests shall be made available to all parties at the completion of each floor or area. However, the Testing Laboratory Representative will report the results of each day's inspection to the general contractor's superintendent before leaving the project site.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**SECTION 01500****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Temporary Controls: Barriers, fencing required to secure the site, , protection of the Work, and water control.
- C. Construction Facilities: Progress cleaning, project signage, and temporary buildings.
 - 1. If contractor plans to have project information on banners attached to the temporary fencing, include the Architects name on the banners. Consult with architect for required graphics
- D. Contractor shall provide and pay all metered cost of temporary facilities and utilities.

1.02 RELATED SECTIONS

- A. Section 01700 - Contract Closeout: Final cleaning.

1.03 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, Fire Department and Rescue Squad Rules.
 - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".
- C. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

1.04 TEMPORARY UTILITIES

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - 1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
- B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
- D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
 - 1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
- E. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully.
 - 1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers.
 - 2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
- F. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

1.05 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases. Special consideration shall be taken for ventilation directly to the exterior of vapors during painting.

1.06 TEMPORARY SANITARY FACILITIES

- A. The Contractor shall provide adequate toilet facilities at the site for use of all workmen. These facilities shall conform to all City, County and State regulations and be constructed in a location and manner so that they will not be a nuisance in the neighborhood. These facilities shall be removed upon completion of the work.

- B. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
- C. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
- D. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1.07 PROTECTION OF WORK

- A. Protect Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Barricades, Warning Signs and Lights: Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

1.08 SECURITY AND ENCLOSURES

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.
- B. Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
- C. Enclosure Fence: Provide 6' high security fence equivalent to chain link around entire site limits with appropriate gates for access of construction and Owner's personnel.

1.09 PARKING, STAGING AND ACCESS TO THE SITE

- A. The Contractor may use areas for parking, staging and stockpiling of materials within the area of limits for the Work.
- B. Ingress and egress to the site shall not interfere with adjacent properties.
- C. Prohibit access to the site by unauthorized personnel.
- D. Upon completion of the project and prior to the final payment, the Contractor shall restore the areas of the site used for his operations to their original condition prior to start of the work.

1.10 TEMPORARY FIRE PROTECTION

- A. Provide and maintain fire extinguishers and other equipment necessary for proper fire protection during construction. In addition, provide one or more qualified personnel with fully charged and operating foam type fire extinguishers during all field welding, roofing and similar operations of adequate capacity which are fire hazardous.
- B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
- C. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
- D. Store combustible materials in containers in fire-safe locations.
- E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
- F. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- G. All temporary contractors' offices, storage sheds, workmen's shanties, etc. shall be located outside of or well detached from, the building under construction.
- H. The installation of water supplies, sprinklers, standpipes and fire hose shall closely follow completion of floors and areas.
- I. Storage of all combustible and flammable materials shall be maintained outside of (and well detached from) the buildings.
- J. Only flame-proofed tarpaulins shall be used.
- K. The supply of paints, solvents, oils, gas cylinders, etc. inside the building shall be limited to that required for one day's use. The handling of these materials should be carefully supervised.
- L. Cutting and welding work shall be performed out-of-doors whenever possible. This type work, when performed inside, shall be closely supervised and done with a fire watch with portable extinguishers in the area.
- M. Temporary electric wiring shall be kept to a minimum. Flood lights shall be used unless unavoidable then individual unprotected lamps may be used. All temporary electric circuits should be properly installed to prevent physical damage, and they should be provided with overload protection as specified in the National Electric Code.
- N. All material heaters (or any similar equipment) shall be located outside the building, with as much detachment as possible.
- O. Hot applications of mastics or insulating materials shall be avoided inside of the building. Where this type of application is necessary in the building interior, adequate ventilation shall

be provided to prevent the build-up of the flammable vapor concentrations, and appropriate fire extinguishing equipment should be maintained in the area during the entire operation.

- P. Smoking is prohibited within the building. Definite control shall be maintained in the storage areas and areas involving flammable liquids.
- Q. No "on site" incineration is permitted.
- R. Ready access for the Public Fire Department shall be maintained to all areas.

1.11 WINDSTORM LOSS PREVENTION

- A. All structural framing members shall be properly secured and braced at the end of each working day.
- B. All roof decking shall be permanently secured as it is laid in place.
- C. All insulation and roofing materials shall be permanently fastened to the roof deck as it is applied.
- D. All construction materials shall be adequately protected against wind damage during storage.
- E. All tarpaulins, or any other temporary enclosure materials, shall be securely fastened.
- F. Remove construction materials from the perimeter of the building and tie them down. This includes smaller items such as tools to larger items such as dumpsters, portable bathrooms and even equipment.
- G. Cover electrical equipment from exposure to the weather.
- H. Clear all storm drains or inlet filters on or near the construction site.

1.12 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.13 FIELD OFFICES

- A. Provide an office space or spaces of sufficient size to accommodate required office-type personnel at the project site and also room for site meeting to accommodate all that would attend the progress meetings, with work stations properly furnished and adequately equipped to accommodate plan layout, and plan and shop drawing filing.

1.14 MISCELLANEOUS PROVISIONS

- A. Dewatering: Maintain the site, excavations and construction free of water.
- B. Rodent and Pest Control: Before foundation Work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be relatively free of pests and their residues at Substantial Completion. Perform control operations in a lawful manner using environmentally safe materials.
- C. Temporary Signs: Prepare project identification and other signs; install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
- D. Project Identification Signs: Engage an experienced sign painter to apply graphics. Sign shall be 8' x 8' exterior grade A-face plywood on 4' x 4' treated wood post.
 - 1. Sign shall contain the information listed below:
 - a. Name of Project.
 - b. Name of Owner and its officials
 - c. Name of Architect.
 - d. Name of Consultants.
 - e. Name of General Contractor
 - f. Rendered picture of the buildings as provided by the Owner

1.15 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

MATERIALS AND EQUIPMENT

SECTION 01600

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions; governed by R.S. 38:2212 (T)(2).

1.02 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.
- D. The name of certain brand, make, manufacturer, or definite specification is utilized only to demote the quality standard of product desired and the bidder is not restricted to the specific brand, make, manufacturer, or definite specification named. The specific brand, make, manufacturer, or definite specification named is used only to convey to prospective bidders the general style, type, character and quality of product desired. Equivalent products will be acceptable if preapproved by the professionally employed engineer for this project.

1.03 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
- C. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
- D. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.05 SUBSTITUTIONS

- A. Substitutions (Definition): Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
- B. Substitution Request Submittal: The Architect will consider requests for substitution if received within 15 days after commencement of the Work. Requests received more than 15 days after commencement of the Work will not be considered.
 - 1. Submit 3 copies of each request for substitution with complete data for consideration.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related specification section and drawing numbers.
 - 3. Provide complete data substantiating compliance with the specified product/system and documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - b. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - c. Samples, where applicable or requested.
 - d. A statement indicating the substitution does not effect the Contractor's Construction Schedule.

- e. Cost information, including a proposal of the net savings, if any in the Contract Sum.
 - f. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - g. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
- 4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
 - a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.
- C. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
 - 1. Revisions to the Contract Documents are not required.
 - 2. Proposed changes are in keeping with the general intent of the Contract Documents.
 - 3. The request is timely, fully documented, and properly submitted.
 - 4. The specified product or method of construction cannot be provided within the contract time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 - 5. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume.
 - 6. The specified product or method of construction cannot receive necessary approval by governing authority, and the requested substitution can be approved.
 - 7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
 - 8. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- D. A request constitutes a representation that the Contractor:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 2. Will provide the same warranty for the Substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 5. Will reimburse Owner for review and/or redesign services associated with re-approval by authorities.
- E. The Contractor's submittal and the Architect's review of shop drawings, product data or samples for construction activities not complying with the Contract Documents do not constitute an acceptable or a valid request for substitution, nor do they constitute approval.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not used

END OF SECTION

MATHES BRIERRE ARCHITECTS

Request For Substitution

(Not for Prior Approvals)

**Project: The National World War II Museum
Floyd Education & Collections Pavilion
1040 Magazine Street Renovations
New Orleans, Louisiana**

Project No. 12274

Sub. No. _____

Date: _____

Contractor:

Brief Description:

Drawing No. _____

Spec. Section _____

Detailed description of why substitution is beneficial:

Architect Response:

Note: Some of the items in this response may result in credits or additions which may become part of a future Request for Change Order.

Initialed: _____

Date: _____

PROJECT CLOSEOUT

SECTION 017000

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, tools, and equipment, and perform all operations necessary for project closeout work indicated or specified.

1.02 DEFINITIONS

- A. Closeout is hereby defined to include general requirements near the end of Contract Time, in preparation for final acceptance, final payment, normal termination of Contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in specification sections.

1.03 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. General: Prior to requesting Architect's inspection, as required by General Conditions, complete the following, and list known exceptions in request. Furthermore, issuance of certificate of substantial completion and Architect's final inspection is contingent on completion of all the following:
 - 1. In the progress payment request that coincides with, or first request following substantial completion date claimed, show portion of work claimed as "substantially complete" or list incomplete items, dollar value of incomplete items, and reasons for being incomplete.
 - 2. Submit statement showing accounting of changes to the Contract Sum.
 - 3. Deliver to Owner tools, spare parts, extra stocks of material, and similar physical items as specifically mentioned in individual specification sections.
 - 4. Complete start-up testing of systems and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
 - 5. Complete final cleaning up requirements.
 - 6. Touch-up and otherwise repair and restore marred exposed finishes.
 - 7. Submit all warranties, workmanship/maintenance bonds, maintenance agreements, final inspection certifications, record (as-built) drawings, final property survey maintenance and operating manuals, final project photographs (if any) and similar documents.
 - a. Note: All above closeout documents must be submitted at one time and be all inclusive.
 - 8. The contractor shall provide a FEMA National Flood Insurance Program Elevation Certificate for the building or buildings. This requirement shall apply to all new buildings. The elevation certificate is to be completed and stamped by a licensed engineer or land surveyor strictly according to the FEMA NFIP Instructions, including the photographs, and with the assumption that it is intended to support a LOMA or LOMR-F request.
 - 9. The HVAC Test and Balance Report, approved by the mechanical consultant, is a prerequisite to Substantial Completion.
 - 10. Final inspection by the AHJ must be submitted along with the Use and Occupancy Permit Certificate.

- B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of incomplete requirements. The Architect will prepare Recommendation of Acceptance following inspection, or advise the Contractor of construction that must be completed or corrected (the Architect's "Punch List") before the certificate will be issued.
 - 1. The Architect will repeat inspection one time when requested and assured that the Work has been substantially completed.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.04 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Prior to requesting Architect's final inspection for final payment, as required by General Conditions, complete the following. List known exceptions (if any) in request. Furthermore, issuance of certificate of final acceptance is contingent on completion of all the following:
 - 1. Submit occupancy and use permit.
 - 2. Submit final payment request with final releases and supporting documentation not previously submitted and accepted.
 - 3. Submit updated final statement, accounting for additional (final) changes to the Contract Sum.
 - 4. Submit copy of final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
 - 5. Submit statement of any continuing insurance coverage.
 - 6. Submit consent of surety.
- B. Reinspection Procedure: Upon receipt of Contractor's notice that work has been completed, including punch list items resulting from earlier inspections, and excepting incomplete items delayed because of unacceptable circumstances Architect will reinspect work. Upon completion of reinspection, Architect will either prepare certificates of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance for final acceptance. If necessary, procedure will be repeated.
 - 1. Should the Architect be required to make two (2) final inspections and he finds that the Work is still incomplete, then the cost of additional Architect's inspections shall be paid for by the Contractor. The aforementioned Architect's compensation will be withheld from the next payment.

1.05 RECORD DOCUMENT SUBMITTALS

- A. General: Specific requirements for record documents are indicated in individual sections of these Specifications. Other requirements are indicated in General Conditions, with additional provisions indicated in Division 15 and Division 16 for mechanical and electrical work, respectively. General submittal requirements are indicated in the Section 01300. Do not use record documents for construction purposes; protect from deterioration and/or loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

- B. Record (As-Built) Drawings: Submit one set of black lines in clean, undamaged condition and CAD electronic drawing files (version 2005) on CD media of Contract Drawings and shop drawings, modified to show actual installations which vary substantially from the work as originally shown. Modify whichever drawing is most capable of showing "field" conditions fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on Contract drawing. All electronic files of contract drawings transmitted to the contractor for his use for shop drawings for this project will require execution of AIA document C-106-2007, Digital Data Licensing Agreement
1. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either concealed work, which would difficult to measure and record at a later date. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
 2. As-builts shall be updated regularly, at least as frequently as the progress meeting, and not at the end of the project.
 3. Contractor shall pay all reproduction, handling and delivery costs.
 4. Contractor shall stamp date and sign each record (as-built) drawing indicating his certification of as-built conditions. The stamp shall read "RECORD AS-BUILT DRAWINGS".
- C. Keys: Provide all keys to Owner as called for in the Finish Hardware Section, Electrical Panelboard keys and any other keys called for in other sections of the Specifications.
1. All keys shall be tagged with same description used in the Hardware Schedule. Other keys shall be tagged with item name and room name and number. "Master" keys shall be so identified.
 2. Keys shall be accompanied by three (3) copies of a typewritten list showing key identification as indicated above and number of keys for each location. One (1) copy shall be initialed by the individual receiving keys and returned to the Contractor as proof of receipt.
- D. Maintenance and Operating Manuals:
1. Provide one (1) hard paper copy and one (1) digital copy on disk.
 2. Organize Maintenance and Operations Manuals into suitable sets of manageable size, and bind into individual binders properly identified and indexed sections, bind each manual of each set in a heavy-duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Provide a minimum of three (3) sets.
- In addition, the Operating and Maintenance Manuals shall include but shall not be limited to the following:
- a. The project title, date of acceptance, names of Architect, General Contractor, subcontractors (associated with the installation of items included in the manual) should be clearly identified on the front cover along with addresses and telephone numbers.
 - b. There shall be an index in front of the manual giving the divisions for major equipment groups and a list of subdivision within the groups.
 - c. The major divisions should have indexed tabs at the front of each one.
 - d. Originals, and legible copies of manufacturers data sheets.
 - e. With the data sheets for each equipment item, attach any parts list, sequence of operations, maintenance requirements, and associated certificates or warranties.
 - f. Include copies of shop drawings.

- g. Any equipment data which covers different models, options, system configurations, etc., should be clearly marked and highlighted to identify which was installed.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 CONTINUING INSPECTIONS

- A. General: Except as otherwise required by specific warranties, agreements to maintain, workmanship/maintenance bonds, and similar continuing commitments, comply with Owner's requests to participate in inspections at end of each time period of such continuing commitments. Participate in general inspection of the work approximately one (1) year beyond date(s) of substantial completion.

3.02 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean transparent materials, including mirrors and glass in doors and windows to a polished condition, removing substances which are not noticeable as vision-obscuring material. Replace broken glass.
 - 3. Clean exposed hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition.
 - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Replace all HVAC filters
 - 5. Remove debris and surface dust from limited-access spaces including roofs, plenum, shafts, trenches, equipment vaults and similar spaces.
 - 6. Clean concrete floors in occupied and non-occupied spaces; broom clean and remove all elements not an integral part of the surface.
 - 7. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.
 - 8. Clean light fixtures and lamps so as to function with full efficiency.
 - 9. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface

END OF SECTION

SOIL INVESTIGATION DATA

SECTION 02005

1.1 INVESTIGATION

- A. Soil and subsurface investigations were conducted at the site, the results of which are to be found in the Geotechnical Exploration report issued by:

Firm Name: Eustis Engineering Services LLC

Dated: October 22, 2013

- B. Copy of the site conditions and boring logs from the report are bound herein following this section.
- C. Bidders are urged to examine soils investigation data and to make their own investigation of the site before bidding.

1.2 INTERPRETATION

- A. Soil investigation data is provided only for information and the convenience of bidders. The Owner and Architect disclaim any responsibility for the accuracy, true location and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretation of that data by bidders, as in projecting soil-bearing values, soil stability and the presence, level and extent of underground water.
- B. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents
- B. Soil investigation data is not part of the Contract Documents.

END OF SECTION



EUSTIS ENGINEERING SERVICES, L.L.C.

3011 28TH STREET
METAIRIE, LOUISIANA 70002-6019
PN 504-834-0157 | FN 504-834-0354
EMAIL: INFO@EUSTISENG.COM | SITE: WWW.EUSTISENG.COM

22 October 2013

The National World War II Museum
945 Magazine Street
New Orleans, Louisiana 70130

Attention Mr. Robert W. Farnsworth

Gentlemen:

Geotechnical Exploration
The National World War II Museum
Hotel and Parking Garage
New Orleans, Louisiana
Eustis Engineering Project No. 22300

Transmitted are two copies (one bound and one unbound) of our engineering report covering a geotechnical exploration for the subject project. One bound copy is being transmitted to Mr. Pete Priola of Mathes Brierre Architects, APC. Electronic copies are also being forwarded to you, Mr. Pete Priola, and Mr. Stephan Bernick of Morphy, Makofsky, Inc.

Thank you for asking us to perform these services.

Yours very truly,

EUSTIS ENGINEERING SERVICES, L.L.C.



BENJAMIN M CODY, P.E.

BMC:jlalal



GEOTECHNICAL EXPLORATION
THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22300

FOR
THE NATIONAL WORLD WAR II MUSEUM
NEW ORLEANS, LOUISIANA

By
Eustis Engineering Services, L.L.C.
Metairie, Louisiana

22 OCTOBER 2013

TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION	1
SCOPE	2
SOIL BORINGS	3
LABORATORY TESTS	4
DESCRIPTION OF SITE CONDITIONS	5
Surface Conditions	5
Subsurface Conditions	5
Seismic Site Classification	6
Ground Water	6
FOUNDATION ANALYSIS	7
Furnished Information	7
Foundation Recommendations	8
Site Preparation	8
Deep Foundations	12
Installation of Driven Piles	17
Test Piles and Load Tests	21
Inspection and Monitoring of Existing Structures	22
Vibrations	23
Pavement Recommendations - Entrance/Exit Ramp Drive Aisles and Loading Bay	26
GEOTECHNICAL SERVICES DURING CONSTRUCTION	29
FIGURES 1 THROUGH 7	
APPENDIX	

GEOTECHNICAL EXPLORATION
THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22300

INTRODUCTION

1. This report contains the results of the geotechnical exploration performed for the proposed National World War II Museum hotel and parking garage to be constructed in New Orleans, Louisiana. The site is bounded by Poeyfarre Street to the south, Magazine Street to the west, Constance Street to the east, and Andrew Higgins Drive to the north. The exploration was performed in general accordance with the scope of work as outlined in Eustis Engineering Services, L.L.C.'s proposal dated 8 August 2013. Authorization to proceed with the exploration was provided on 19 August 2013 by Mr. Robert W. Farnsworth, Senior Vice President of Capital Programs for the National World War II Museum. Mathes Brierre Architects, APC, is the project architect. Morphy, Makofsky, Inc., is the structural engineer for the project.

2. This report has been prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of The National World War II Museum; Mathes Brierre; and Morphy, Makofsky for specific application to the subject site. In the event of any changes in the nature, design, or location of the proposed construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified and verified in writing. Should these data be used by anyone other than The National World War II Museum; Mathes Brierre; or Morphy,

Makofsky, the user should contact Eustis Engineering for interpretation of data and to secure any other information pertinent to this project.

3. The analyses and recommendations contained in this report are based in part on data obtained from soil borings performed at the subject site. The nature and extent of variations in subsoil conditions between and away from the boring locations may not become evident until construction. If variations then appear, it will be necessary to reevaluate the recommendations contained in this report.
4. Recommendations and conclusions contained in this report are to some degree subjective and should be used only for design purposes. The report in its entirety should not be included in the contract plans and specifications. However, the results of the soil borings and laboratory tests contained in the Appendix of this report may be included in the plans and specifications.

SCOPE

5. The exploration included the drilling of eight soil test borings to evaluate subsoil conditions and stratification, and to obtain samples of the various substrata. Soil mechanics laboratory tests, performed on samples obtained from the borings, were used to determine the physical properties of the subsoils. Engineering analyses, based on the soil borings and laboratory tests, were made to determine recommendations regarding site preparation, drainage, seismic Site Classification, allowable compressive and tensile pile load capacities for various types and embedments of piles, estimates of settlement, components and thicknesses for flexible and rigid pavements, and general foundation construction procedures. Note, our project scope includes soil-pile interaction analyses for a limited number of laterally loaded vertical pile groups. We recommend these analyses be performed after loads and pile types, sizes, and layouts are finalized and submitted under separate cover.

6. Eustis Engineering's scope of work does not include the investigation or detection of the presence of any biological pollutants in or around the subject site. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, and the byproducts of any such biological organisms.

SOIL BORINGS

7. Eight undisturbed sample type soil test borings, identified as B-1 through B-8, were performed at the site on 9 through 20 September 2013. Borings B-1, B-2, B-4, B-5, B-7, and B-8 were drilled to a depth of 100 feet below the existing ground surface. Borings B-3 and B-6 were drilled to a depth of 125 feet each. These borings were performed with a truck mounted rotary type drill rig.
8. The approximate locations of the borings are shown on Figure 1. Detailed descriptive logs of the borings and laboratory tests are shown in both tabular and graphical form in the Appendix. GPS coordinates obtained using a handheld unit are shown on the boring logs in the form of longitude and latitude in the Appendix. Upon completion of drilling the borings, the holes were backfilled and/or grouted in accordance with current regulatory requirements.
9. Cohesive or semi-cohesive subsoils were sampled at close intervals or changes in strata using a 3-in. diameter thinwall Shelby tube sampling barrel. The undisturbed samples were immediately extruded from the sampling barrel in the field. Pocket penetrometer tests were performed on trimmed ends of the extruded samples to provide a general indication of the soil's shear strength or consistency. The results of these tests are shown on the boring logs in the Appendix under the column heading "PP." All samples were inspected and visually classified by Eustis Engineering's soil technician. Representative portions of the samples were placed in moisture proof containers and returned to Eustis Engineering's laboratory for additional testing.

10. Samples of cohesionless or semi-cohesive subsoils were obtained during the performance of in situ Standard Penetration Tests. This test consists of driving a 2-in. diameter splitspoon sampler 1 foot into the soil after first seating it 6 inches. A 140-lb weight dropped from a height of 30 inches is used to advance the sampler. The number of blows required to drive the sampler the final 12 inches is defined as the standard penetration resistance. The standard penetration resistance is indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The standard penetration resistances are shown on the boring logs in the Appendix under the column heading "SPT." These samples were inspected and visually classified by Eustis Engineering's soil technician. Representative samples were placed and sealed in moisture proof containers for transportation to our laboratory.

LABORATORY TESTS

11. Soil mechanics laboratory tests, consisting of natural water content, unit weight, unconfined compression shear (UC), and unconsolidated undrained triaxial compression shear (OB), were performed on selected samples obtained from the borings. The test establishing the percent passing the U. S. Standard No. 200 sieve was also performed on representative samples of the subsoils. These tests aid in the classification of the subsoils and provide an indication of their relative compressibility. The results of these laboratory tests are provided on the boring logs in the Appendix.
12. Grain size analyses (SV) were also performed on selected samples of cohesionless soils to determine their particle distribution curve. The results of these tests are shown on separate sheets following the boring logs in the Appendix.

DESCRIPTION OF SITE CONDITIONS

Surface Conditions

13. Ground surface conditions at the time of our exploration were observed to be generally level. The site currently occupies an entire city block, which is paved and is currently in use as a parking lot. Remnants of structurally braced exterior walls from former structures recently demolished at the site were observed by our field personnel during our field activities.

Subsurface Conditions

14. Geology. At the project site, the surface is generally mantled by 5 to 9 inches of asphalt and concrete pavement that overlies fill extending to depths of 2 to 10 feet below the existing pavement surface. Fill comprises soft to stiff brown, reddish-brown, tan, and gray clay, sandy clay, and silty clay with silty sand pockets, silt pockets, gravel, brick, and shell fragments and loose brown silty sand with clay pockets and gravel. Below the fill materials, natural levee deposits were encountered to depths of 7 to 17 feet. These natural levee deposits comprise soft to stiff tan, brown, and gray clay, silty clay, and sandy clay with silt pockets, roots, and wood. Next in the stratigraphy, point bar deposits were encountered that extend to the terminal depths of 100 to 125 feet in the borings. Point bar deposits consist of silts and clays which grade into sands.
15. In general, soft to medium stiff clay and silty clay were encountered to depths of 47 to 59 feet overlying medium dense to dense sands in the point bar deposits in Borings B-1, B-4, and B-7, identified on Figure 1 as Cross-Section I. In general, soft to medium stiff clay and silty clay extend to depths of 46 to 50 feet that overlie loose to medium compact gray sandy silt and clayey silt that continue to depths of 63.5 to 73 feet in Borings B-2, B-3, B-5, B-6, and B-8, identified on Figure 1 as Cross-

Section II. Below the silts in Cross-Section II, medium dense to dense sands were encountered that extend to the bottom of these borings. Interpreted stratigraphies at each of the boring locations are shown on the individual boring logs in the Appendix.

Seismic Site Classification

16. Referencing the soil borings performed for the project, our knowledge of the geologic conditions in the area, and using Table 1613.5.2 of the 2009 International Building Code, the subsurface conditions at the site may be categorized as Site Class E, a "soft soil profile." More than 10 feet of the subsoils in the top 100 feet below the ground surface was tested and determined to have an undrained shear strength of less than 500 psf and water contents greater than 40%.

Ground Water

17. To determine ground water conditions at the time of our field exploration, two of the borings were made without the addition of water to depths of 6 to 9 feet (Borings B-6 and B-1, respectively). The water table was initially encountered at a depth of 9 feet in Boring B-1 and 6 feet in Boring B-6 in the bore holes. A second measurement after observation periods of 30 minutes each indicated that ground water levels had risen to a depth of 5 feet in Boring B-1 and 3.5 feet in Boring B-6 before drilling fluids were introduced to advance the bore holes. A third measurement was made in Boring B-6 after approximately 96 hours of completion of the boring, and the ground water was observed to still be at a depth of 3.5 feet. Note, the observation periods prior to the addition of drilling fluids were relatively short, and the ground water levels in the bore holes may not have stabilized before our field crew advanced the holes with the aid of drilling fluids. Based on laboratory moisture content tests of the near surface samples and the site's proximity to the

Mississippi River, we have assumed that the ground water table is located approximately 3 feet below the existing ground surface for our analyses.

18. The depth to ground water will vary with climatic conditions, stages in the nearby Mississippi River, drainage improvements, and other factors. Since the depth to ground water is subject to variations, it should be verified by those persons responsible for construction immediately prior to the initiation of work.

FOUNDATION ANALYSIS

Furnished Information

19. Information furnished by Mathes Brierre and Morphy, Makofsky indicates the proposed parking garage will be six to seven stories tall and will occupy nearly the entire city block. The first floor of the structure will consist of retail stores, and levels two through six (and possibly seven) will be used for parking. The top floor may consist of parking or an open meeting hall space. Column loads for the superstructure were not provided, but individual pile capacities of 100 tons per pile are anticipated. The first floor retail units may be supported by treated timber or timber composite piles with anticipated single pile loads of 25 tons per pile. Very little site grading fill (i.e., 12 inches or less) is anticipated to raise the site to construction grades.
20. Traffic estimates were not provided, but a preliminary project layout includes 470 individual parking spaces, and there will be no ground floor parking, only a single access ramp for the upper floors. One side of the structure will also support a loading bay for the structure.

Foundation Recommendations

21. The structures may be supported on driven pile foundations, including a combination of square, precast concrete piles for the heavily loaded columns for the superstructure and treated timber or timber composite piles for support of the first floor retail units. Each similarly loaded and integrated feature should be supported on piles having approximately the same tip embedment below the existing ground surface. However, due to the variable nature of the foundation deposits, an extensive test pile program is recommended to further assess anticipated pile tip embedments and installation requirements. Further evaluation of differential settlement potential for features supported on alternate pile types and embedments may also be necessary.

Site Preparation

22. Drainage During Construction. The initial step to prepare the site for construction should be to establish adequate temporary and permanent drainage to prevent ponding of water and ensure immediate runoff of rainfall. We recommend the contractor maintain adequate surface drainage away from all foundation areas during and after construction. This may be accomplished by utilizing existing drainage features as well as by setting grades to ensure positive drainage of water away from the foundation areas. Sumps and pumps may be required to remove rainfall and ground water from shallow excavations. Throughout construction, the contractor should exercise caution during inclement weather to ensure subsoil support is not degraded by construction operations.
23. Permanent Drainage. The near surface soils are subject to a reduction in shear strength and excessive settlement if the moisture content increases (naturally or as a result of construction operations). We recommend adequate permanent drainage be provided to collect rainfall away from the new and existing foundations and

pavement areas after the completion of construction. All downspouts draining rainfall away from the existing structure's roof should be connected to pipes which discharge into the site's storm water collection and disposal system. Water should not be allowed to collect near the pavement or foundation areas.

24. Clearing and Stripping. Beneath the proposed pavement and foundation areas, the existing ground surface should be stripped of vegetation, loose topsoil, debris, and any other deleterious materials. Stripping should be to a depth necessary to remove any deleterious materials and reach firm undisturbed soils. The exact depth of stripping should be determined during construction. Clearing and stripping should also comply with Section 201 of the Louisiana Standard Specifications for Roads and Bridges, 2006 edition (LSSRB).
25. Demolition. We understand demolition of the former structures shown on Figure 1 is complete, with the exception of some exterior facades that were braced and left in place on the western side of the site. Any remaining structures and pavements located within the proposed construction areas should be completely demolished and removed from the site. Provisions should be made to locate any abandoned underground utilities and foundations which could impact new construction. Existing footings or abandoned pipes should be excavated and removed from the site. These structures could impact the performance of new foundations or pavements if not properly removed, proofrolled, and backfilled with structural fill material. Existing piles should not be removed. In general, these features should be cut off 5 feet below the proposed grade beams or below the existing ground surface, whichever is greater. Removal and relocation of structures and obstructions should also comply with Section 202 of the LSSRB.
26. Subgrade Preparation. After the stripping, clearing, and demolition operations, the exposed surface should be proofrolled with a bulldozer, compactor, or tracked vehicle exerting a ground pressure between 10 and 15 psi. The vibratory system

on the compactor, if present, should not be used during proofrolling. ***All clearing, proofrolling, and compaction operations should be performed only during periods of dry weather.*** Proofrolling the exposed subgrade should identify weak areas or depressions which may remain within the structure or pavement footprints. Weak zones or depressions identified during proofrolling should be thoroughly cleaned out to the surface of firm subsoils and backfilled with a select sand fill. Motorized wheeled equipment should not be allowed within the foundation areas during periods of inclement weather to prevent rutting of the subgrade.

27. Structural Fill and Backfill. A select granular material, such as locally available river sand, should be used as backfill and/or fill if required to reach design grade. Sand fill (AASHTO A-3) should be non-plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve. The maximum organic content should not exceed 5% by weight. This material will expedite construction and drain freely after inclement weather. Prior to transporting fill on site, a sample of the borrow pit should be tested to verify its conformance to these recommendations.
28. General Fill. Onsite materials excavated during construction that do not meet the requirements of select fill may be used for topsoil and other general grading, but should not be used as select structural backfill beneath foundations or pavements. General fill used as topsoil and other general grading purposes should be compacted to the minimum requirements given below.
29. Compaction. Structural fill placed beneath pile supported structures should be spread in loose lifts of 8 to 10 inches. Form fill or backfill placed beneath the pile founded structure should be compacted to 95% of its maximum dry density near optimum moisture in accordance with ASTM D 698. Select fill or general fill used for non-structural grading should be spread in loose lifts of 10 to 12 inches and compacted by several passes of a bulldozer.

30. Quality Control. Density tests should be performed on each lift of the compacted structural fill and backfill to determine if the contractor has achieved the recommended density. All clearing, filling, and compaction operations should be accomplished only during periods of dry weather. The contractor should exercise caution during and after inclement weather to ensure subsoil support is not degraded by construction operations.
31. Fill Settlement. Very little (i.e., less than 1 foot), if any, additional fill is anticipated to be required to raise the site to construction grades. Generally, less than 1 foot of fill will not appreciably affect consolidation of the underlying subsoils above and beyond settlements caused by the foundation load of the structure. Should more than 1 foot of site grading fill be added to the site, Eustis Engineering should be notified immediately to review our recommendations and revise as necessary.
32. Areal Subsidence. Our estimates of settlement do not include the effect of areal subsidence over the design life of the structure. Areal subsidence is a result of past filling and lowering of the ground water level over large areas. Areal subsidence is considered a background condition over which man has no control and should be relatively uniform in the project area. Sufficient information is not available in the geotechnical exploration to make accurate estimates of areal subsidence in the project area. However, based on our experience and recent studies in the New Orleans metropolitan area, we estimate areal subsidence to be approximately 4 to 9 inches per century. Additional settlement of 3 to 7 inches may occur per foot of permanent lowering of the ground water table due to ongoing drainage improvements.
33. Differential Settlement Considerations. Differential settlement will occur between pile supported structures, the ground surface, and any adjacent surface founded structures or pavements. Therefore, appropriate architectural or structural features should be incorporated in your design to accommodate differential settlement. A

joint considering vertical movements should be provided between any grade supported pavements and pile supported features such as the parking garage ramp to accommodate potential differential settlement.

34. Utilities. We recommend flexible type connections be specified for all piping and utilities going to and from the proposed structure. These connections should be designed to accommodate the potential settlements and differential settlements described in the previous paragraphs due to fill placement and areal subsidence. Also, pipes and conduits beneath the pile supported structure should be structurally supported by hangers attached to the pile supported grade level slab as prescribed by building code.

Deep Foundations

35. Allowable Pile Load Capacities. Analyses have been made to determine the estimated allowable single pile load capacities in compression and tension for various sizes of treated ASTM D 25 quality timber or timber composite piles and square, precast concrete piles. The results of our analyses are presented on Figures 2 through 5. Due to the variable nature of the site geology and subsurface conditions, estimated capacities for treated timber piles and square, precast concrete piles have been grouped by areas of the site with similar geologic conditions (Cross-Sections I and II) representing the western one-third and eastern two-thirds of the site, respectively.
36. Pile Refusal. Variations in site geology as discussed previously may result in variable penetration resistances for installed piles. However, attempts should be made to install all piles for isolated elements of the structure to the same approximate tip embedment. Refusal criteria for the timber piles may be taken as 25 blows per foot with the recommended hammers as discussed below. If the piles are driven with a follower, or if the pile driving helmet is allowed to impact the

ground surface, Eustis Engineering should be consulted to adjust this refusal criteria. Refusal criteria for square, precast concrete piles should be determined in the test pile program.

37. Factors of Safety. The allowable pile load capacities presented on Figures 2 through 5 neglect the capacity within the uppermost 2 feet for embedment of the pile in the cap. Allowable pile capacities for new piles placed closer than 2 feet to an existing pile location should be investigated further. These allowable pile load capacities also contain an estimated factor of safety of 2 against failure of a single pile through the soil and assume a comprehensive test pile program that includes static pile load tests evaluating all potential pile types and sizes proposed for use across the site indicative of the variations in subsurface geology as described previously. A 1.33 increase may be utilized when evaluating transient wind load conditions.
38. Temporary Lateral Load Capacity. Limited lateral capacity may be used on piles subjected to transitory loads such as wind. These are empirical and may be used without further analyses. Precast concrete piles with side dimensions of 12, 14, 16, and 18 inches may be assumed to provide a temporary lateral resistance of 1.5, 2, 2.5, and 3 tons per pile, respectively. Treated ASTM D 25 quality timber piles with minimum tip diameters of 7 to 8 inches and minimum butt diameters of at least 12 inches may be assumed to provide a temporary lateral resistance of 1 ton per pile. All piles resisting temporary lateral loads should have a minimum tip embedment of 40 feet. Timber composite piles should not be used to resist lateral or tensile loads.
39. ***Limited soil-pile interaction analyses of vertical piles installed in groups subject to lateral loads are included in our project scope. We recommend performing these soil-structure interaction analyses after lateral loads and***

pile sizes, embement, and layout are finalized. The results of these analyses may be submitted under separate cover.

40. Batter Piles. Alternatively, lateral loads may also be resisted by batter piles. Pile load capacities shown on Figures 2 through 5 may be used to estimate horizontal load resistances for battered piles. The vertical component of the batter piles are equated to the load capacities for identically sized vertical piles driven to the same tip elevations. This relationship may be used to determine the axial capacities and horizontal components of the batter piles as shown on Figure 6.
41. Timber Piles. We recommend the treatment of timber piles meet the current American Wood Preservers Association Standards as outlined in Section 1014 of the LSSRB for both preservative and quality assurance. Treatment should also follow Section 812.06 where applicable. Furthermore, we recommend the timber piles meet the quality (clean peeled, straightness, etc.) requirements outlined in ASTM D 25 and size requirements outlined in Table 1014-1 of the LSSRB. The pile dimensions assumed in our analyses are provided on Figures 2 and 3.
42. Timber Composite Piles. Composite piles should consist of an untreated ASTM D 25 quality timber pile having a minimum 7-in. tip and 13-in. butt lower section and a 12-in. diameter concrete filled metal can upper section. The metal can upper section should extend a minimum distance of 10 feet below the existing ground surface to protect the untreated timber section. The metal can section should be of sufficient thickness to withstand handling stresses and soil and water pressures. We recommend a maximum can length of 15 feet. A mandrel impacting the timber pile butt should be used to install the metal can. Prior to placing concrete, the metal can should be inspected to ensure it is free of water. Concrete placed in the metal can should have a minimum compressive strength of 2,500 psi or as dictated by structural requirements. Timber composite piles should not be used to resist lateral or tensile loads.

43. Square, Prestressed, Precast Concrete Piles. We recommend the precast concrete piles meet the requirements outlined in Section 805.14 of the LSSRB. Precast concrete piles should be designed to have a strand prestress that is structurally sufficient to facilitate driving of the piles without damage. Our analyses are based on single intact sections or spliced sections having square cross-sections. Pile splices should not protrude beyond the perimeter of the pile cross-section. Alternate precast concrete pile configurations (pipe, triangle, etc.) should be further evaluated. The estimated capacities do not include the weight of the pile.
44. Structural Capacity. Analyses for pile capacities are based on a soil-pile relationship only. Therefore, the structural capacity of the piles and their connections to transmit these loads should be determined by the structural engineer.
45. Pile Group Capacity. For piles firmly embedded within point bar deposits, a part of their supporting capacity will be derived from end bearing and no reduction in group capacity will be required when evaluating compressive capacities. For timber, timber composite, and precast concrete piles not embedded in the point bar deposits, and for all piles subjected to tension loads, the piles will derive the majority of their supporting capacity through skin friction. Therefore, it is necessary to consider the effect of group action. In this regard, the supporting value of the friction piles driven in groups should be investigated on the basis of group perimeter shear by the formula shown on Figure 7. When evaluating the tensile capacity of pile groups, the second term of the formula should be neglected.
46. Pile Spacing. The minimum center-to-center pile spacing within a row or group of timber or timber composite piles should be at least 3 feet or 5% of the embedded length, whichever is greater. The minimum spacing between individual precast concrete piles should be determined by the formula given on Figure 7. The minimum spacing between rows of piles should also meet the requirements

discussed in the "Estimated Total Settlement due to Structural Loads" section of this report. Pile spacing requirements may not minimize influence of individual piles on each other with respect to lateral load resistance, settlement, or vertical group capacity.

47. Estimated Total Settlement due to Structural Loads. We recommend concrete slabs be cast monolithically with grade beams and rigidly connected to pile caps to minimize the potential for differential settlement. Consolidation settlement of piles tipped in the point bar sand deposits in the western one-third of the site, and piles tipped in the point bar sand deposits below a depth of 80 feet in the eastern two-thirds of the site, should be anticipated to be minimal ($\frac{1}{4}$ inch or less). Consolidation settlement of piles tipped in the point bar sand and silt deposits between the depths of 60 and 80 feet in the eastern two-thirds of the site may be anticipated to experience slightly larger settlements of $\frac{1}{2}$ to 1 inch.
48. We have performed elastic settlement analyses for the column loads for a four-pile group of 14-in. square, precast concrete piles with a 400-ton column load (four piles loaded to 100 tons per pile). For the 14-in. square, precast concrete piles, we have assumed a pile spacing of 6 feet to determine the estimated bearing area of the pile cap and piles. The pile loads were assumed to be 100 tons per pile in a four-pile group. Our analyses indicate elastic settlement of $\frac{1}{4}$ to $\frac{1}{2}$ inch could be experienced for piles firmly embedded within the point bar sands and supporting the 400-ton column loads. The magnitude of the elastic settlement is influenced by the relative density of the sand deposits that vary across the site.
49. Elastic settlement should occur instantaneously with the application of structural loads. Eustis Engineering should be contacted as individual column loads and pile types, sizes, and embedments are established to evaluate settlement and differential settlement potential between columns with disproportionate loading.

50. These estimates do not include elastic deformation of the piles which should be added to the settlement estimates. Elastic deformation of piles may generally be estimated as 67% to 75% of the static column strain of a pile acting as a column. Our estimates of settlement are due to structural loads only. Detailed elastic deformation can be better defined once the pile length, type, and group sizes are established.
51. Our estimates of settlement are based on the assumptions piles will be driven in small groups or widely spaced rows and no more than 12 inches of site grading fill will be placed at the site to raise grades. We have assumed the largest group dimension will be no greater than 20% of the pile length and the center-to-center spacing between groups will be no closer than twice the largest group dimension. We have assumed the center-to-center spacing between rows of single piles will be no closer than 8 feet, or nine pile diameters, whichever is greater. In the event any of our assumptions are not met, Eustis Engineering should be contacted to evaluate the potential settlement of the pile foundations.
52. Differential Settlement. The design should recognize the potential for differential settlement between features supported by different pile types and lengths. A joint to accommodate these movements should be provided between any adjoining pile foundations of differing types and sizes to accommodate potential differential settlement. In addition, the structure should be designed as rigidly as possible to minimize the potential for differential settlements.

Installation of Driven Piles

53. Quality Control. Close field supervision should be maintained by experienced personnel to ensure proper procedures are followed and accurate records are kept for all pile driving operations. The driving record should include, as a minimum, the date, pile type, overall length, side dimension or tip and butt diameter of the pile,

embedment below finished grade, depth and diameter of prepunch or predrill, hammer type, stroke height, and number of blows per foot of penetration. An accurate driving record is especially important to verify the piles are installed to the required tip embedment and to give an indication of any unusual driving characteristics which may indicate pile breakage.

54. Air Hammers. We recommend ASTM D 25 quality timber piles having minimum tip diameters of at least 7 inches and minimum butt diameters of at least 12 inches be driven with a single acting air hammer having a manufacturer's rated energy of 15,000 ft-lbs per blow. For these piles, the ram weight should not exceed 5,000 pounds and the maximum stroke should also be limited to 3 feet. Using this driving energy, timber piles should be driven no harder than 25 blows per foot (refusal) to minimize structural damage to the piles.
55. We recommend a single acting air hammer be used to install the precast concrete piles. The manufacturer's rated energy required to drive the piles will depend on the piles' allowable compressive capacity. A tabulation of the estimated hammer energy versus allowable compressive capacity (factor of safety ≈ 2) is provided in Table 1. For precast concrete piles, we also recommend the hammer weigh one-third to one-half of the weight of the pile.

TABLE 1: RECOMMENDED SINGLE ACTING AIR HAMMER DRIVING ENERGIES

ESTIMATED ALLOWABLE SINGLE PILE LOAD COMPRESSIVE CAPACITY IN TONS FACTOR OF SAFETY ≈ 2	APPROXIMATE RATED SINGLE ACTING HAMMER ENERGY IN FT-LBS/BLOW
Up to 60	19,500
60 to 120	24,000
120 to 180	32,500

56. Diesel Hammer. In lieu of an air hammer, a diesel hammer may also be used for the installation of the precast concrete piles. We recommend the diesel hammer have a rated energy of one and one-half times the energy recommended for a comparable installation with a single acting air hammer.
57. Alternate Installation Methods. We do not recommend vibratory methods be utilized for pile installation. If a vibratory hammer is selected for the project, Eustis Engineering should be contacted to evaluate the reduction in the estimated allowable pile load capacities presented. Also, we do not recommend the use of jetting to aid in the installation of the timber piles. Eustis Engineering should be consulted for additional installation criteria if jetting is required for precast concrete piles. If any other alternate installation methods are selected, Eustis Engineering should be contacted to evaluate the impact on the estimated capacities presented.
58. Pile Refusal. Attempts should be made to install all piles for a single feature to the same approximate tip embedment to minimize differential settlement. Refusal criteria for the timber piles may be taken as 25 blows per foot with the recommended hammer to minimize damage to these piles. Refusal criteria for the precast concrete piles should be determined based on the results of the test pile program and dynamic analyses or testing. Refusal of precast concrete piles may occur within the point bar sands throughout most of the site at depths of 50 to 80 feet below grade.
59. Note, if the piles are driven with the aid of a follower, or if the pile driving helmet is allowed to impact the ground surface, high penetration resistances not indicative of capacity may be realized. If this is the case, Eustis Engineering should be consulted to evaluate pile installation. Installation criteria should be established during the test pile program.

60. Prepunching or Predrilling. Prepunching or predrilling may be required at the site to penetrate the surficial desiccated crust, wood, or existing fills to avoid damaging timber and precast concrete piles. Prepunching or predrilling through these surficial deposits may be required to depths of approximately 5 to 10 feet below the existing ground surface. Predrilling of timber piles may be required to achieve the embedments provided and may be required at other areas of the site not identified by our exploration. For precast concrete piles, predrilling may also be necessary to achieve final tip embedments, depending on the pile embedments selected. However, continuity of the sand deposits may preclude the use of predrilling. A pilot hole has the potential of minimizing vibrations resulting from pile driving operations or reducing the potential damage to piles and may also be considered.
61. The prepunch or predrill bit should be no larger than the pile tip diameter for timber piles or 75% of the side width for precast concrete piles. Predrilling through surficial materials may be by dry auger methods. Wet rotary methods using a fishtail bit would be required for deeper predrilling. Actual requirements should be determined during the test pile program. In no case should predrilling extend closer than 10 feet above the final pile tip embedment.
62. Dynamic Analyses. The precast concrete piles should be designed by a structural engineer to have cross-sections which are structurally sufficient to facilitate driving of the piles without damage. Dynamic analyses (WEAP) should be performed to evaluate driving stresses, pile cushion, and driveability once the hammer and appurtenant equipment have been selected. Structural requirements can then be verified by a structural engineer and installation criteria can be established. Eustis Engineering recommends hammer approval by WEAP analyses in accordance with Section 804.05(c)(1) of the LSSRB.

Test Piles and Load Tests

63. Eustis Engineering considers a test pile program and load test as an extension of our geotechnical exploration. Therefore, Eustis Engineering should be retained to perform these services. The actual number of test piles should be determined based on the number and type of piles used in any one area. Eustis Engineering should be consulted to develop a test pile program to delineate variations in the pile tip embedment over the footprint of the structure and to investigate pile installation requirements consistent with the project's scope once more detailed design information becomes available. Expansion of the scope of a probe pile program may also be required depending on the variability observed during the test pile program.
64. The test piles should be the same type and embedment anticipated for the job piles and installed with the same equipment and techniques proposed for the job piles for the structure. Driven test piles will also provide more definitive information regarding the anticipated driving resistance, requirements for predrilling, and vibrations from pile driving.
65. The test piles should be allowed to set for at least 14 days subsequent to the installation of the reaction system. The test piles should then be load tested to failure in accordance with ASTM D 1143 and the New Orleans Building Code. The results should be evaluated by Eustis Engineering to verify the estimated pile load capacities presented in this report. As an alternate, precast concrete piles may be evaluated using dynamic pile testing methods to evaluate capacity.
66. Dynamic Pile Testing. The initial installation of precast concrete piles should be monitored and evaluated by DPT using a Pile Driving Analyzer®. A PDA can monitor driving stresses during installation and evaluate pile integrity during or after installation. A PDA can also monitor energy transferred to the pile by the hammer

to evaluate pile installation efficiency. In order to evaluate pile capacity, a “restrike” DPT should be performed a minimum of 14 days after its initial installation. Shorter restrike set times may be considered, but shorter restrikes may not indicate the full ultimate capacity. In any case, we do not recommend a restrike set time less than seven days to evaluate capacity. Data from this restrike should be further evaluated by CAPWAP® analyses. For piles driven to refusal within the point bar sand deposits, it may be necessary to provide a hammer with a higher rated energy than used to install the piles to perform the restrike to evaluate capacity. Thus, a variable energy hammer should also be considered for the initial pile installation. Eustis Engineering is available to perform and evaluate the results of DPT and CAPWAP analyses.

Inspection and Monitoring of Existing Structures

67. Construction activities and methods in tightly congested urban areas will affect adjacent structures, pavements, or utilities. These affects are usually associated with vibrations (as discussed below), dewatering, and excavations. Prior to construction operations, it is recommended any existing structures, pavements, and utilities near the proposed project be thoroughly inspected to establish their existing condition. A sufficient number of photographs of the surrounding structures should be taken prior to construction to accompany these inspections. The inspection may also include level surveys to establish the relative positions of existing features. Crack monitoring using telltales may also be advisable depending on the findings of the preconstruction surveys. Construction monitoring should include vibration monitoring and possibly acoustic monitoring.
68. A more detailed risk analysis regarding the impact of the proposed construction should be performed during the final design. As part of the risk analysis, the existing project features should be thoroughly inspected and evaluated as discussed above. However, regardless of the outcome of the risk analysis, the

recommended monitoring program should still be undertaken during construction. This monitoring should be evaluated on a daily basis to further evaluate the impacts of construction and changes in the risk assessment. It may be necessary to modify construction methods if the monitoring indicates unacceptable levels of damage.

Vibrations

69. General. Pile driving operations, hauling of fill materials, and other construction operations will cause vibrations that may affect nearby structures, pavements, and underground utilities. Damage due to construction vibrations is usually associated with movements of equipment, particularly heavy trucks and pile driving. Vibrations induced by pile driving operations depend on the displacement of the soil and the frequency of the exciting vibrations. Vibrations associated with vehicular construction traffic are dependent on the size and speed of individual vehicles as well as frequency.
70. Measurement. We recommend peak particle velocities due to construction operations be monitored at critical structures or pavements with a seismograph during all construction operations that have a potential to cause vibrations. The record of peak particle velocities will provide information in assessing potential damage and the types of changes best suited to the project requirements. In this regard, vibrations should be measured during the test pile program so that modifications to installation procedures can also be assessed to verify impacts on the design capacity of the piles.
71. Damage Criteria. Many researchers have related peak particle velocity and frequency to structural damage and human response. The bulk of these data was developed by the U.S. Bureau of Mines in order to study damage associated with blasting. Other researchers have related pile driving activities to peak particle velocities in a similar manner as the U.S. Bureau of Mines. Regardless of the origin

of study, there is general agreement on the results of vibratory effects on structures and human perception.

72. Available literature indicates peak particle velocities in excess of 4 to 5 inches per second may result in noticeable damage to residential construction. A level of 2 inches per second is generally considered a safe level to avoid damage to pile supported structures in relatively good condition. Damage associated with these levels of vibrations is generally associated with cracks in wall or ceiling elements. Low peak particle velocity levels can also be a problem for poorly constructed buildings or structures that have been previously stressed by settlement or other movements. In such cases, vibrations on the order of 0.5 in./sec can initiate cosmetic damage or further cosmetic damage that has already taken place in the structure.
73. The potential for damage or distress is increased if the peak particle velocities occur at a frequency coincident with the natural or dominant frequency of structures. Research indicates the natural frequency of residential or light commercial construction to be 5 to 30 hertz. The perception of vibrations by persons in the vicinity of construction activities occurs at lower levels of peak particle velocity than will cause damage to structures. Levels of 0.25 to 1 in./sec are generally considered unpleasant to intolerable by human perception. Levels as low as 0.04 in./sec are still perceptible to individuals. From the perspective of public relations, human perception of vibrations may be of major concern. In this regard, a tolerance of 0.25 in./sec should generally be regarded as a vibration level uncomfortable to human perception.
74. Vibrations are transmitted through foundation soils and attenuate with distance. Peak particle velocity criteria should be applied at the structure of concern. Measurement of peak particle velocity at or near the source of exciting activity is not

indicative of damage potential of a structure away from the source. Attenuation characteristics at the site should be assessed during the test pile program.

75. Considering the potential for cosmetic damage and the adverse perception to human response, we recommend a level of 0.5 in./sec be set as a construction tolerance for pile driving and other transient type construction activities. This level is generally achievable with current construction methods. However, for sustained peak particle velocities in excess of 0.25 in./sec at a pavement, utility, or structure of concern, Eustis Engineering should be notified.
76. Settlement of adjacent structures due to vibrations is also of concern for the management of construction projects. Settlement induced by vibratory loads may occur due to densification of sand or silt fill and foundation strata. Also, the collapse of near surface organic deposits that have experienced biochemical degradation would lead to surface subsidence. Limited studies are available on the effects of construction related vibratory loads associated with the densification of cohesionless materials. We can find no applicable information on the collapse of organic deposits due to vibratory loads.
77. Literature available to Eustis Engineering indicates densification of cohesionless soils becomes significant at peak particle velocities (measured at the ground surface) ranging between 0.2 and 0.4 in./sec. However, in these studies, densification occurred in loose (30% relative density) near surface fill. Based on this information, we recommend peak particle velocities, measured at the surface, be limited to 0.25 in./sec for settlement considerations.
78. Settlement associated with the densification of fill or cohesionless foundation strata could result in significant settlement and damage to adjacent surface supported structures or pavements and pile supported structures. Settlement associated with the collapse of near surface organic soils would not likely affect structures since

these would probably be supported on piling penetrating these deposits. However, settlement of pavements constructed over organic deposits may occur.

79. Mitigation Techniques. Mitigation techniques to dampen the effects of vibrations on structures are generally associated with decreasing the energy exciting vibrations through the soil. For pile driving, this is primarily accomplished by pile selection, hammer selection, or alternate installation techniques. Predrilling can also be used to minimize vibrations. Since these installation techniques can have significant effect on pile capacity, predrilling operations should be carefully planned and properly monitored during installation of pile foundations and should be assessed during the test pile program.

Pavement Recommendations - Entrance/Exit Ramp Drive Aisles and Loading Bay

80. Design Assumptions. We have assumed there will be no light duty traffic/parking on the first floor of the structure, areas beneath pavements will be prepared by stripping and proofrolling as described previously in this report; and traffic loading for the upper level parking ramp entrance/exit lanes will consist of approximately four vehicular trips per day of passenger vehicles for each parking space. Our analyses for the entry/exit ramp access lanes consider approximately 50% of the passenger vehicles will be automobiles with 2-kip front and rear single axle loads, and approximately 50% of the vehicles will be passenger trucks, vans, or sports utility vehicles with a 2-kip front single axle load and a 5-kip rear single axle load. For the loading bay, we have assumed traffic will consist of 22 delivery trucks per week that are assumed to have 12-kip front single axle loads and 20-kip rear single axle loads. We have also assumed the loading bay will support four waste disposal truck trips per week, with these vehicles assuming to have 24-kip front single axle loads and 30-kip rear tandem axle loads. Minimal traffic from passenger vehicles of four trips per day were also assumed to be possible in the loading bay area.

These distributions were assumed to apply over a design period of 20 years without a growth factor.

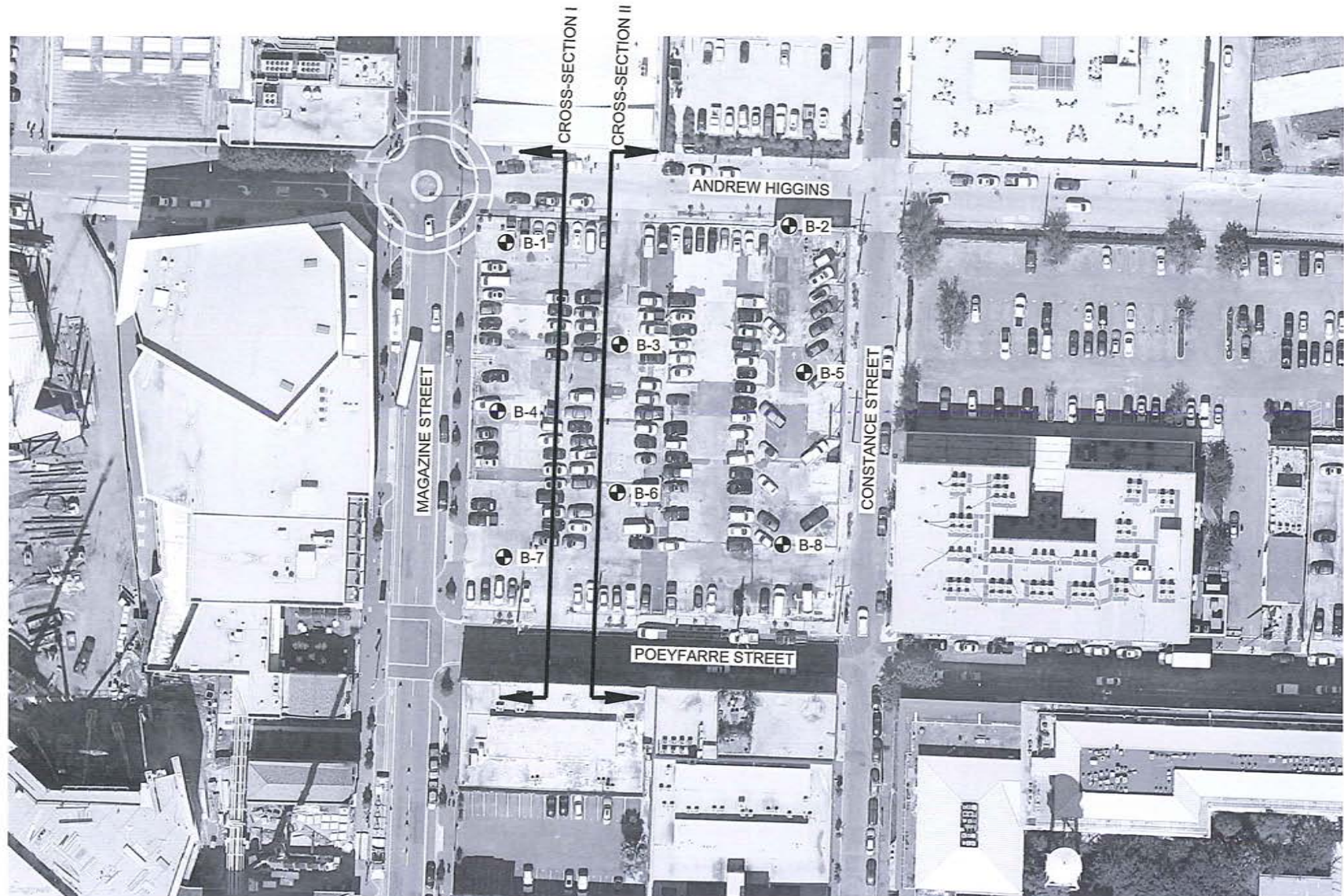
81. The assumed traffic was converted to equivalent 18-kip single axle loads (E_{18}) using AASHTO equivalency factors for flexible and rigid pavements. Assumed traffic loadings and applications should be verified prior to implementation of design. If traffic conditions are significantly different than those presented, Eustis Engineering should be contacted to reevaluate the pavement recommendations contained in this report.
82. Method of Analysis. The pavement components and thicknesses were determined using methods presented in the 1986 AASHTO Guide for Design of Pavement Structures. In addition, the resilient soil modulus (M_r) of the subgrade was estimated based on the type of soil, probable drainage conditions, and engineering experience.
83. Flexible Pavement. We recommend heavy duty flexible pavements for the entrance/exit lanes for the upper level parking ramp and the loading bay area have an overall thickness of 18 inches. This pavement section should consist of 1.5 inches of Type 3 wearing course, 2.5 inches of Type 3 binder course, 6 inches of crushed stone base course, and 8 inches of sand subbase.
84. Our analyses assume all paving materials will conform to the LSSRB (2000 edition). The asphaltic concrete should conform to all requirements for Type 3 wearing and binder courses in accordance with Section 501 of the LSSRB (2000 edition). The material for the crushed stone base course should conform to all requirements of Section 1003.03(d) of the LSSRB. Placement and compaction of the base course should follow Section 302 of the LSSRB for a Class II crushed stone base course. Subbase should follow the recommendations given in "Structural Fill" for sand fill.

Structural sand fill used as subbase should be compacted to 95% of its maximum dry density in accordance with ASTM D 1557.

85. Grades should provide for adequate drainage to prevent saturation of the subgrade, subbase, and base course materials. Otherwise, subsurface drainage and/or edge drains should be provided. If the type and thickness of the pavement components are changed, Eustis Engineering should be consulted to determine the suitability of these materials and the structural number of the pavement.
86. Rigid Pavement. Using the same soil and traffic conditions, Eustis Engineering recommends rigid pavement for the driveways and service areas comprise 7 inches of Portland Cement Concrete placed over a minimum of 8 inches of compacted sand fill. We also recommend trash container pads be 8 inches of Portland Cement Concrete.
87. Portland Cement Concrete should conform to the material requirements for Pavement Type B concrete as specified in Section 901 of the LSSRB. This concrete has a 28-day compressive strength of 4,000 psi. Concrete pavements should be wire mesh reinforced against the effects of temperature and shrinkage, and should be constructed in accordance with the provisions of the LSSRB, Section 601. The sand fill should conform to the material requirements given in "Structural Fill." The sand subbase should be compacted to 95% of its maximum dry density near optimum water content using ASTM D 1557.
88. Grades should provide for adequate drainage to prevent saturation of sand fill beneath the pavement. Otherwise, subsurface drainage and/or edge drains should be provided. All joints should be sealed to prevent infiltration of water. All pavement details, such as wire mesh, reinforcement, dowels, joints, curbs, etc., should be designed by a pavement design engineer.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

89. To provide continuity among the exploration, design, and construction phases, Eustis Engineering should be retained to provide additional geotechnical and materials testing services. Geotechnical engineering services may include the review of the contract plans and specifications to evaluate their conformance to the recommendations contained in this report. Other services include compaction and density tests of structural fill, logging the installation of test piles and job piles, performance and evaluation of static and dynamic load tests, concrete and steel inspection, and other soils and materials testing services which will provide quality control during construction and conformance to design specifications.
90. Once the pile driving equipment is established, Eustis Engineering can perform dynamic analyses (WEAP) to evaluate driveability of the pile, driving stresses in the pile cross-section, and hammer approval. Eustis Engineering can also perform DPT services during installation and evaluate PDA data with respect to driving stresses, load capacity, and pile integrity; and perform CAPWAP analyses to further evaluate the data.
91. In summary, Eustis Engineering should be retained to monitor all geotechnical related work performed by the contractor. If construction problems arise, Eustis Engineering should be notified to participate in the development of solutions. This participation permits the geotechnical engineer to evaluate the effects of unanticipated conditions and propose solutions on the geotechnical design assumptions particular to the project. The design geotechnical engineer may also be able to judge how site specific soil and ground water conditions will affect the success of a proposed construction alternative.



⊕ DENOTES LOCATIONS OF UNDISTURBED SOIL BORINGS DRILLED:
9 THROUGH 20 SEPTEMBER 2013

NOT TO SCALE



EUSTIS ENGINEERING SERVICES, L.L.C.

GEOTECHNICAL ENGINEERS

3011 28TH STREET

METairie, LOUISIANA

BORING LOCATION PLAN

THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA

DRAWN BY: J.L.S.

PLOT DATE: 21 OCT 13

CADD FILE:
LOCATION PLAN.DGN

CHECKED BY: B.M.C.

JOB NO.: 22300

FIGURE 1

THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22300

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
TREATED ASTM D 25 QUALITY TIMBER AND TIMBER COMPOSITE PILES
CROSS-SECTION 1 (B-1, B-4, AND B-7)
MAGAZINE STREET SIDE

PILE TYPE AND SIZE	ESTIMATED PILE EMBEDMENT BELOW THE EXISTING GROUND SURFACE IN FEET ⁽¹⁾	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES IN TONS ⁽²⁾ FACTOR OF SAFETY ≈ 2 ⁽³⁾	
		COMPRESSION	TENSION
7-In. Tip 12-In. Butt Timber	45 50	12½ 14½	8½ 9½
7-In. Tip 13-In. Butt Timber or Composite ⁽⁵⁾	55 60-62 ⁽⁴⁾	17 25 ⁽⁴⁾	11½ ⁽⁵⁾ 13½ ⁽⁵⁾

⁽¹⁾Selection of pile tip embedment should also consider settlement potential.

⁽²⁾These estimated capacities do not include limitations on structural capacity as imposed by some building codes.

⁽³⁾Use of a factor of safety of 2 assumes a static pile load test is performed.

⁽⁴⁾Estimated capacity assumes piles are driven to a blow count indicative of capacity in medium dense to very dense fine sand deposits encountered at depths of 48 to 59 feet in Borings B-1, B-4, and B-7 (Cross-Section I).

⁽⁵⁾Timber composite piles should not be used to resist lateral or tensile loads.

THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22300

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
TREATED ASTM D 25 QUALITY TIMBER AND TIMBER COMPOSITE PILES
CROSS-SECTION II (B-2, B-3, B-5, B-6, AND B-8)
CONSTANCE STREET SIDE

PILE TYPE AND SIZE	ESTIMATED PILE EMBEDMENT BELOW THE EXISTING GROUND SURFACE IN FEET ⁽¹⁾	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES IN TONS ⁽²⁾ FACTOR OF SAFETY ≈ 2 ⁽³⁾	
		COMPRESSION	TENSION
7-In. Tip 12-In. Butt Timber	45 50	12½ 14½	8½ 9½
7-In. Tip 13-In. Butt Timber or Composite ⁽⁴⁾	55 60 65	19½ 23 25 ⁽²⁾	13 15½ ⁽⁴⁾ 17½ ⁽⁴⁾

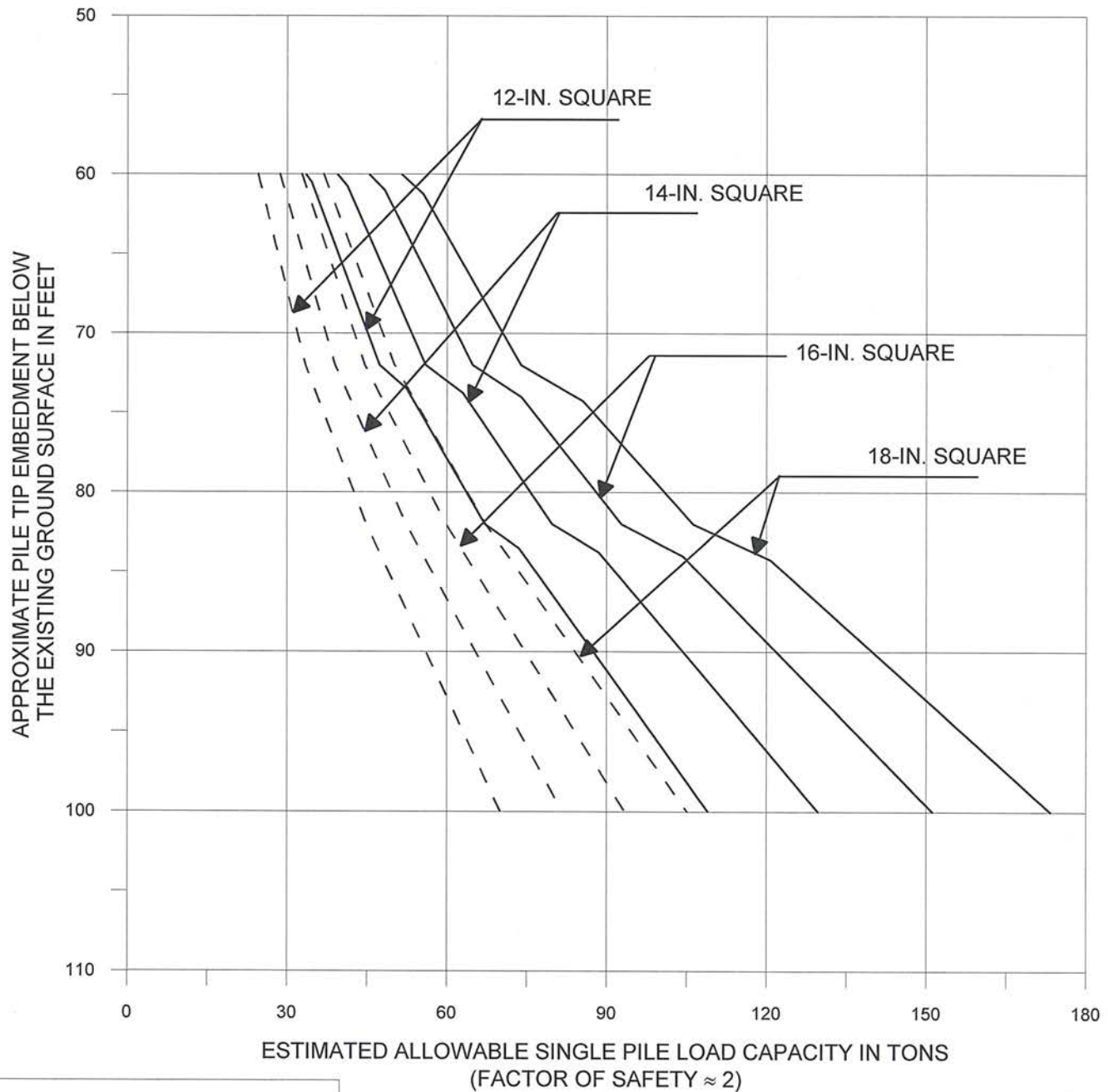
⁽¹⁾Selection of pile tip embedment should also consider settlement potential.

⁽²⁾These estimated capacities do not include limitations on structural capacity as imposed by some building codes.

⁽³⁾Use of a factor of safety of 2 assumes a static pile load test is performed.

⁽⁴⁾Timber composite piles should not be used to resist lateral or tensile loads.

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES CROSS-SECTION I (B-1, B-4, AND B-7) MAGAZINE STREET SIDE



NOTES:

- (1) THE ESTIMATED CAPACITIES SHOULD BE VERIFIED BY A LOAD TEST.
- (2) PILES ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM JETTING.
- (3) ALLOWABLE PILE LOAD CAPACITIES PRESENTED ON THIS FIGURE DO NOT INCLUDE THE WEIGHT OF THE PILES.



EUSTIS ENGINEERING SERVICES, L.L.C.
GEOTECHNICAL ENGINEERS
3011 28TH STREET METAIRIE, LOUISIANA

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE PRECAST CONCRETE PILES
CROSS-SECTION I

THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA

DRAWN BY: B.M.C.

4 OCT. 2013

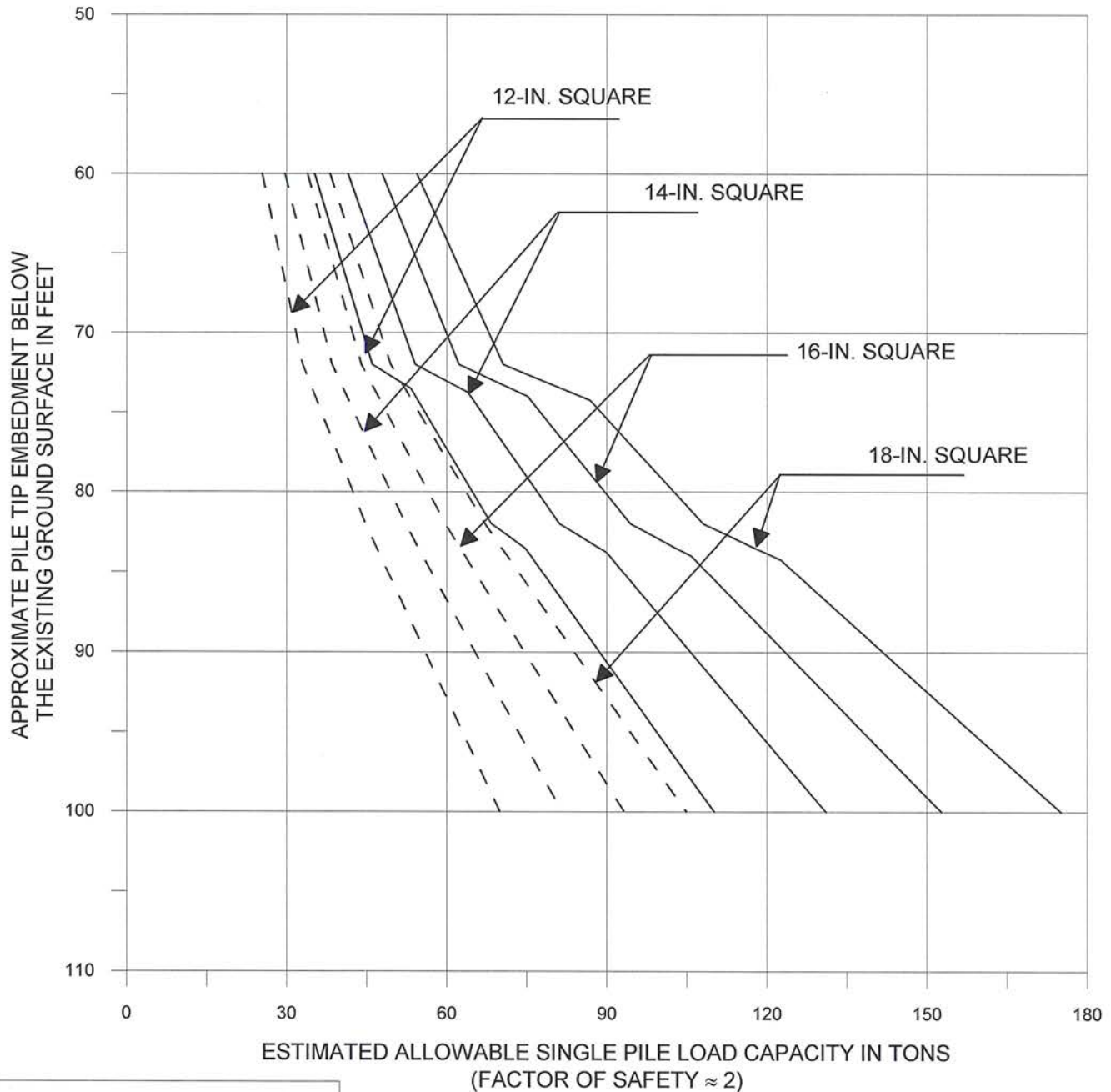
FILE: FIGURE 5.GRF

CHECKED BY: G.P.S.

JOB NO.: 22300

FIGURE 4

**ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
CROSS-SECTION II
(B-2, B-3, B-5, B-6, AND B-8) CONSTANCE STREET SIDE**



NOTES:

- (1) THE ESTIMATED CAPACITIES SHOULD BE VERIFIED BY A LOAD TEST.
- (2) PILES ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM JETTING.
- (3) ALLOWABLE PILE LOAD CAPACITIES PRESENTED ON THIS FIGURE DO NOT INCLUDE THE WEIGHT OF THE PILES.



EUSTIS ENGINEERING SERVICES, L.L.C.
GEOTECHNICAL ENGINEERS
3011 28TH STREET METAIRIE, LOUISIANA

**ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE PRECAST CONCRETE PILES
CROSS-SECTION II**

**THE NATIONAL WORLD WAR II MUSEUM
HOTEL AND PARKING GARAGE
NEW ORLEANS, LOUISIANA**

DRAWN BY: B.M.C.

4 OCT. 2013

FILE: FIGURE 6.GRF

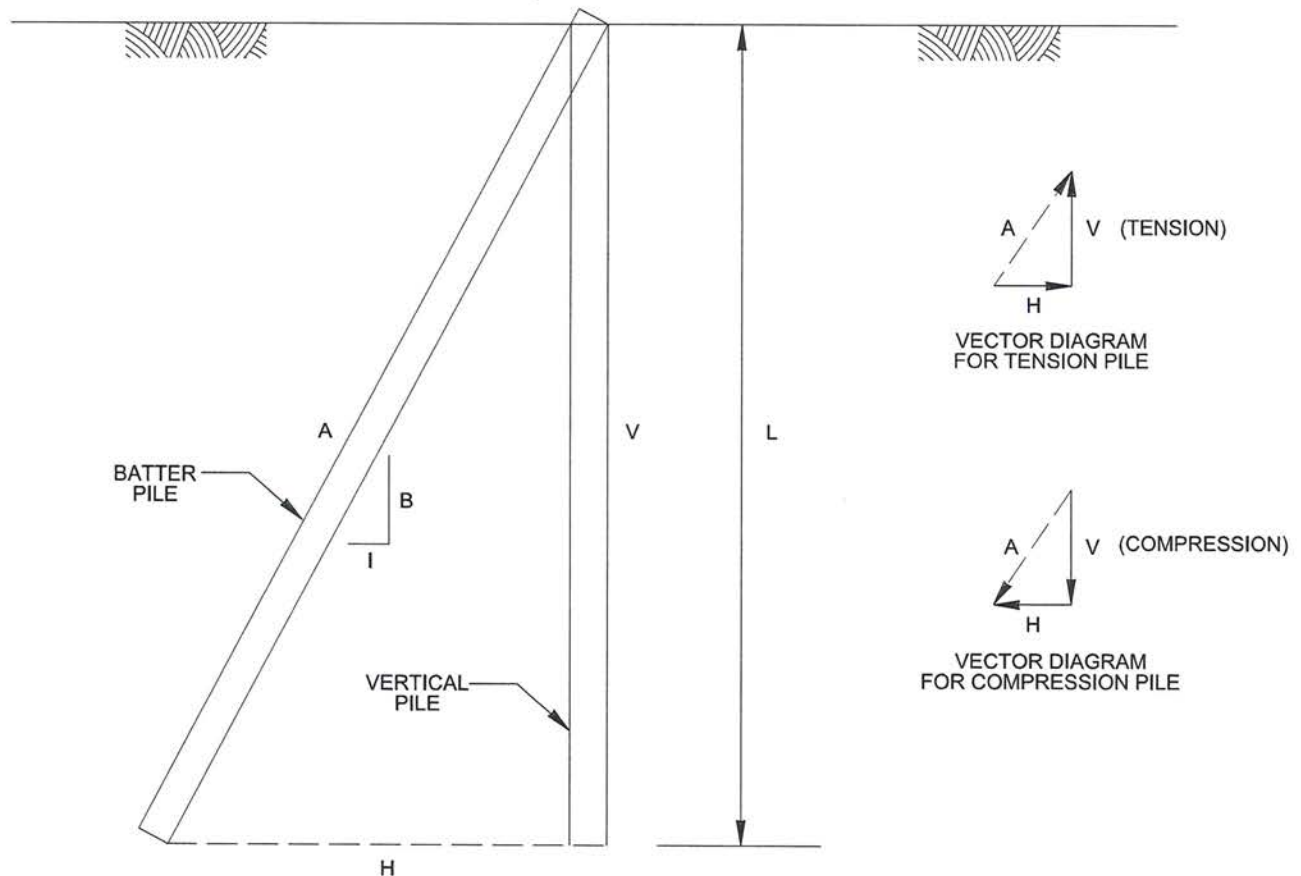
CHECKED BY: G.P.S.

JOB NO.: 22300

FIGURE 5



**AXIAL AND HORIZONTAL RESISTANCE OF BATTER PILES
ESTIMATED FROM ALLOWABLE VERTICAL LOAD CAPACITIES**



L = VERTICAL COMPONENT OF BATTER PILE EMBEDMENT LENGTH.

V = ESTIMATED ALLOWABLE SINGLE LOAD CAPACITY OF A PILE DRIVEN VERTICALLY WITH EMBEDMENT LENGTH, L.

B = BATTER OF PILE EXPRESSED AS A RATIO OF VERTICAL DISTANCE TO ONE FOOT HORIZONTAL DISTANCE.

H = HORIZONTAL RESISTANCE OF BATTER PILE ESTIMATED AS FOLLOWS: $H = \frac{V}{B}$

A = ALLOWABLE AXIAL PILE LOAD CAPACITY OF A SINGLE BATTER PILE ESTIMATED AS FOLLOWS: $A = \sqrt{V^2(1 + \frac{1}{B^2})}$

NOTE: THE AXIAL LOAD RESISTANCE OF A VERTICAL PILE, V, IS DEPENDENT ON THE TYPE OF LOADING - TENSION OR COMPRESSION. CAUTION SHOULD BE EXERCISED TO ENSURE THE CORRECT VERTICAL CAPACITY IS USED.

CAPACITY OF PILE GROUPS

The maximum allowable load carrying capacity of a pile group is no greater than the sum of the single pile load capacities, but may be limited to a lower value if so indicated by the result of the following formula.

$$Q_a = \frac{P \times L \times c}{(FSF)} + \frac{2.6 q_u (1 + 0.2 \frac{w}{b}) A}{(FSB)}$$

In Which:

Q_a	=	Allowable load carrying capacity of pile group, lb
P	=	Perimeter distance of pile group, ft
L	=	Length of pile, ft
c	=	Average (weighted) cohesion or shear strength of material between surface and depth of pile tip, psf
q_u	=	Average unconfined compressive strength of material in the zone immediately below pile tips, psf (unconfined compressive strength = cohesion x 2)
w	=	Width of base of pile group, ft
b	=	Length of base of pile group, ft
A	=	Base area of pile group, sq ft
(FSF)	=	Factor of safety for the friction area = 2
(FSB)	=	Factor of safety for the base area = 3

The values of c and q_u used in this formula should be based on applicable soil data shown on the Log of Boring and Test Results for this report. In the application of this formula, the weight of the piles, pile caps and mats, considering the effect of buoyancy, should be included.

SPACING WITHIN PILE GROUPS

$$SPAC = 0.05 (L_1) + 0.025 (L_2) + 0.0125 (L_3)$$

In Which:

SPAC	=	Center to center of piles, feet
L_1	=	Pile penetration up to 100 feet
L_2	=	Pile penetration from 101 to 200 feet
L_3	=	Pile penetration beyond 200 feet

NOTE: Minimum pile spacing = 3 feet or 3 pile diameters, whichever is greater

APPENDIX



LEGEND AND NOTES FOR
LOG OF BORING AND TEST RESULTS

PP	Pocket penetrometer: Resistance in tons per square foot											
SPT	Standard Penetration Test: Number of blows of a 140-lb hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches											
SPLR	Type of Sampling		Shelby		SPT		Auger		No sample			
SYMBOL	Clay		Silt		Sand		Peat/Humus		Shells		Stone/Gravel	
Predominant type shown heavy; Modifying type shown light												
USC	Unified Soil Classification											
DENSITY	Unit weight in pounds per cubic foot											

SHEAR TESTS

TYPE

UC	Unconfined compression shear
OB	Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
UU	Unconsolidated undrained triaxial compression shear
CU	Consolidated undrained triaxial compression shear
DS	Direct shear

ϕ	Angle of internal friction in degrees
c	Cohesion in pounds per square foot

ATTERBERG LIMITS

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index

OTHER TESTS

CON	Consolidation
PD	Particle size distribution (sieve and/or hydrometer)
k	Coefficient of permeability in centimeters per second
SP	Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

- (1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.
- (2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/9/2013

LOG OF BORING AND TEST RESULTS

B-1

Latitude: 29.94263

Longitude: -90.06984

Water Depth: See Text

Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					7" Concrete	SM	1	0.5	17									
					Loose brown silty sand w/gravel	CL	2	1	28									
	0.75	3			Soft brown & gray silty clay w/brick fragments & trace of shell fragments	CH	3	3	36	82	112	UC	--	761				
5	1.00				Medium stiff tan & gray clay w/silt pockets		4	5										
	0.25				Soft gray clay w/silt pockets	CH	5	8	59	65	104	UC	--	429				
10					Medium stiff gray clay w/silt lenses	CH	6	11										
15							7	14	38	83	114	UC	--	506				
20							8	19										
25					Very soft gray silty clay	CL	9	24	52	69	105	UC	--	580				
30							10	29	49	72	107	OB	0	224				
35	0.25				Soft gray silty clay	CL	11	34										
40							12	39	39	81	113	OB	0	351				
45	0.25						13	44										
	0.50				Medium stiff gray clay w/silty sand pockets & lenses	CH	14	49	57	66	103	UC	--	763				
50																		

NOTES:

EUSTIS GINT LIBRARY04102013 GLB EE STANDARD BORING LOG 22300 GPJ EE STANDARD DATATEMPLATE GDT 10/18/13



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/9/2013

LOG OF BORING AND TEST RESULTS

B-1

Latitude: 29.94263

Longitude: -90.06984

Water Depth: See Text

Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50					Soft gray silty clay w/clay layers	CL												
55	0.50						15	54	43	78	112	UC	--	387				
60		20			Loose gray silty sand	SM	16	59										
					Medium dense gray silty sand	SM	17	60.5										
65		20					18	63.5										
		20					19	66.5										
70		21					20	69.5										
					Dense gray silty sand	SM	21	73.5										
75		35																
							22	78.5										
80		35																
							23	83.5										
85		43																
							24	88.5										
90		32																
							25	93.5										
95		39																
100		33																

NOTES:

EUSTIS GINT LIBRARY04102013.GLB EE STANDARD BORING LOG 22300.GPJ EE STANDARD DATATEMPLATE.GDT 10/16/13



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-2

New Orleans, Louisiana
Project No: 22300

Latitude: 29.94256
Longitude: -90.06928

Water Depth: See Text
Total Depth: 100.0 ft

EUSTIS ENGINEERING

Date: 09/20/2013

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					5" Concrete	CL	1	0.4	26									
	0.50				Medium stiff brown silty clay w/gravel & brick fragments	CH	2	1	29									
					Medium stiff gray clay w/brick fragments		3	2	31									
5	0.50						4	5	36									
	0.50						5	8	43									
10	0.75				Medium stiff gray & tan clay w/trace of silt pockets	CH	6	11	47	75	110	OB	0	550				
	0.50						7	14										
15					Medium stiff gray clay w/trace of silt lenses	CH	8	18	47	73	107	UC	--	576				
	0.25						9	23										
20					Very soft gray silty clay	CL		26										
	0.25						10	28	36	85	115	UC	--	234				
25																		
	0.25				Soft gray clay w/silty sand lenses	CH	11	33										
30																		
	0.25						12	38	44	77	111	UC	--	475				
35																		
	0.25						13	43										
40																		
	0.25						14	46.4	63	63	102	OB	0	484				
45					w/silt lenses													
	0.25						15	49										
50		20			Medium compact gray sandy silt	ML												

NOTES:



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-2

EUSTIS ENGINEERING

New Orleans, Louisiana
Project No: 22300

Date: 09/20/2013

Latitude: 29.94256
Longitude: -90.06928

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50					Medium compact gray sandy silt	ML												
		25	X				16	52										
55		26	X				17	55										-#200 = 63.5%
		25	X				18	58										
60																		
		28	X		Medium dense gray silty sand	SM	19	64										
65																		
		31	X		Dense gray silty sand	SM	20	69										
70																		
		31	X				21	74										-#200 = 23.5%
75																		
		34	X				22	79										
80																		
		30	X				23	84										
85																		
		44	X				24	88										
90																		
		47	X				25	94										
95																		
		46	X				26	99										
100																		

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/16/2013 - 09/17/2013

LOG OF BORING AND TEST RESULTS

B-3

Latitude: 29.94242
Longitude: -90.06967

Water Depth: See Text
Total Depth: 125.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					5" Concrete	CL												
					Medium stiff reddish-brown sandy clay w/brick fragments	CL	1	2	26									
5					Medium stiff reddish-brown silty clay w/gravel	CL	2	4	31									
					Red brick fragments	GP	3	5	27									
					Medium stiff gray clay w/brick fragments	CH	4	6	50									
10	0.50																	
	0.25				Soft gray silty clay w/trace of roots	CL	5	11	35	85	115	UC	--	301				
15	0.25				Soft gray clay w/trace of silt pockets	CH	6	14										
20	0.25						7	18	46	75	110	UC	--	330				
25	0.25						8	23										
30	0.25				Soft gray silty clay	CL	9	28	49	72	108	UC	--	394				
35	0.50				Medium stiff gray clay w/silt pockets	CH	10	33										
40	0.50						11	38	61	63	102	UC	--	642				
45	0.50						12	43	70	58	99	UC	--	766				
50	0.50				Soft gray silty clay	CL	13	48	38	83	115	UC	--	298				

NOTES:

EUSTIS GINT LIBRARY04102013.GLB EE STANDARD BORING LOG 22300.GPJ EE STANDARD DATATEMPLATE.GDT 10/7/13



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/16/2013 - 09/17/2013

LOG OF BORING AND TEST RESULTS

B-3

Latitude: 29.94242
Longitude: -90.06967

Water Depth: See Text
Total Depth: 125.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50					Very loose gray silty sand	SM	14	53	26	97	122	OB	0	204				-#200 = 74.6%
55		20	X		Medium compact gray clayey silt	ML	15	56										
60		20	X		w/fine sand		16	59										
65		29	X				17	62										
70		29	X				18	65										-#200 = 14.4%
75		25	X		Medium dense gray silty sand	SM	19	69										
80		24	X				20	74										
85		33	X		Dense gray silty sand	SM	21	79										
90		33	X				22	84										
95		31	X				23	89										
100		30	X				24	94										
		63	X		Very dense gray silty sand	SM	25	99										

NOTES:



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-3

New Orleans, Louisiana
Project No: 22300

Latitude: 29.94242
Longitude: -90.06967

Water Depth: See Text
Total Depth: 125.0 ft

EUSTIS ENGINEERING

Date: 09/16/2013 - 09/17/2013

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
100					Very dense gray silty sand	SM												
105		58	X				26	104										
110		56	X				27	109										
115		75=10"	X		Very dense gray fine sand	SP	28	114										
120		76	X				29	119										
125		75=9"	X				30	124										
130																		
135																		
140																		
145																		
150																		

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/10/2013 - 09/11/2013

LOG OF BORING AND TEST RESULTS

B-4

Latitude: 29.94235

Longitude: -90.06993

Water Depth: See Text

Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					6" Concrete	CH												
0.75					Medium stiff tan & gray clay w/silty sand pockets & trace of brick fragments	CH	1	2	38	82	113	UC	--	545				
5					Soft brown silty clay	CL	2	5	35	84	114	UC	--	374				
0.50																		
0.75					Soft gray & tan silty clay	CL	3	8										
10							4	11	39	83	115	UC	--	310				
0.50							5	14										
15																		
0.50					Soft gray clay w/silt pockets & lenses	CH	6	19	48	74	109	UC	--	311				
20																		
25					Soft gray silty clay	CL	7	24										
30							8	29	41	78	110	OB	0	396				
35																		
0.50					Medium stiff gray clay w/silty sand lenses	CH	9	34										
40							10	39	59	64	102	UC	--	677				
0.75																		
45					Very loose gray sandy silt	ML	11	44	31	92	120	OB	0	581				
0.25																		
50					Loose gray sandy silt	ML	12	49	26	77	97	OB	0	628				

NOTES:

EUSTIS GINT LIBRARY04102013.GLB EE STANDARD BORING LOG 22300.GPJ EE STANDARD DATATEMPLATE.GDT 10/18/13



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-4

EUSTIS ENGINEERING

New Orleans, Louisiana
Project No: 22300

Date: 09/10/2013 - 09/11/2013

Latitude: 29.94235
Longitude: -90.06993

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50		21	X		Medium dense gray silty sand	SM	13	50.5										SV
55		20	X				14	53.5										
		24	X				15	56.5										
60		22	X		Medium dense gray silty sand w/sandy silt	SM	16	59.5										
65		22	X				17	63.5										
70		25	X				18	68.5										
75		30	X				19	73.5										
80		33	X		Dense gray silty sand	SM	20	78.5										
85		43	X				21	83.5										
90		74	X		Very dense gray silty sand	SM	22	88.5										
95		39	X		Dense gray sandy silt	ML	23	93.5										
100		42	X				24	98.5										

NOTES:



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-5

New Orleans, Louisiana
Project No: 22300

Latitude: 29.94230
Longitude: -90.06932

Water Depth: See Text
Total Depth: 100.0 ft

EUSTIS ENGINEERING

Date: 09/19/2013

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					6" Concrete	CL	1	0.5	25									
					Medium stiff tan & reddish-tan silty clay w/shell fragments	CL	2	3	28	94	120	UC	--	320				
5	0.50				Soft gray silty clay		3	5										
	0.50				Medium stiff gray silty clay	CL	4	8	51	72	108	UC	--	572				
10					Medium stiff gray clay w/trace of silt pockets	CH	5	11										
	0.50				Soft gray clay w/silt pockets & trace of concretions	CH	6	14	46	75	110	UC	--	361				
15	0.50						7	18										
20					Very soft gray silty clay	CL	8	23	48	74	109	OB	0	179				
25							9	28										
30	0.25				Soft gray silty clay	CL	10	33	37	85	116	UC	--	256				
35	0.25						11	38										
40	0.25				Soft gray clay w/silty clay layers	CH	12	43	35	87	117	OB	0	486				
45	0.25				Loose gray clayey silt	ML	13	48	60	63	101	UC	--	980				
50	0.50				Medium stiff gray clay w/silt lenses	CH												

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/19/2013

LOG OF BORING AND TEST RESULTS

B-5

Latitude: 29.94230

Longitude: -90.06932

Water Depth: See Text

Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50		27	X		Medium compact gray sandy silt	ML	14	51										
55		28	X				15	54										-#200 = 62.6%
		28	X				16	57										
60		26	X				17	60										
65		29	X		Medium dense gray silty sand	SM	18	64										
70		30	X		Dense gray & tan fine sand w/silt	SP-SM	19	69										
75		32	X				20	74										-#200 = 10.5%
80		33	X				21	79										
85		30	X				22	84										
90		40	X				23	89										
95		59	X		Very dense gray fine sand	SP	24	94										
100		60	X				24	99										

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/12/2013 - 09/13/2013

LOG OF BORING AND TEST RESULTS

B-6

Latitude: 29.94217

Longitude: -90.06973

Water Depth: See Text

Total Depth: 125.0 ft

Scale in Feet	PP	SPT	SPL R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					6.5" Concrete	CL												
					Medium stiff reddish-brown silty clay w/brick fragments	CL	1	2	24									
5	0.25				Soft gray & tan silty clay w/brick fragments	CL	2	4	31									
	0.25				Medium stiff gray & tan silty clay	CL	3	8	34	86	115	UC	--	591				
10	0.50				Medium stiff gray & tan clay	CH	4	11	41	79	112	UC	--	727				
	0.75				Medium stiff gray silty clay	CL	5	14	34	87	116	UC	--	663				
15																		
	0.25				Soft gray silty clay	CL	6	19										
20																		
	0.25						7	24	42	79	112	UC	--	459				
25																		
	0.25						8	29										
30																		
					Soft gray silty clay w/clay layers	CL	9	34	43	76	109	OB	0	337				
35																		
	0.50				Medium stiff gray clay w/trace of silt pockets	CH	10	39	66	60	99	UC	--	900				
40																		
	0.25				Soft gray silty clay	CL	11	44	37	83	114	OB	0	454				
45																		
		10			Medium compact gray clayey silt	ML	12	49	29									
50																		

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/12/2013 - 09/13/2013

LOG OF BORING AND TEST RESULTS

B-6

Latitude: 29.94217

Longitude: -90.06973

Water Depth: See Text

Total Depth: 125.0 ft

Scale in Feet	PP	SPT	SPT R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50		16	X		Medium dense gray silty sand	SM	13	51.5										-#200 = 23.9%
55		21	X				14	54.5										
60		18	X				15	57.5										
65		28	X				16	63.5										-#200 = 26.0%
70		38	X		Dense gray silty sand	SM	17	68.5										
75		48	X		Dense gray fine sand	SP	18	73.5										
80		47	X				19	78.5										
85		41	X				20	83.5										
90		42	X				21	88.5										
95		40	X				22	93.5										
100		46	X				23	98.5										

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/12/2013 - 09/13/2013

LOG OF BORING AND TEST RESULTS

B-6

Latitude: 29.94217

Longitude: -90.06973

Water Depth: See Text

Total Depth: 125.0 ft

Scale in Feet	PP	SPT	SPT R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
100					Dense gray fine sand	SP												
105		44	X				24	103.5										
110		49	X				25	108.5										
115		50=6"	X		Very dense gray fine sand	SP	26	113.5										
120		50=5"	X				27	118.5										
125		50=6"	X				28	123.5										
130																		
135																		
140																		
145																		
150																		

NOTES:



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-7

New Orleans, Louisiana
Project No: 22300

Latitude: 29.94210
Longitude: -90.06998

Water Depth: See Text
Total Depth: 100.0 ft

EUSTIS ENGINEERING

Date: 09/11/2013 - 09/12/2013

Scale in Feet	PP	SPT	SPL R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					6" Concrete	SM												
					Loose brown silty sand w/clay pockets	CH	1	2	11									
5	0.50				Medium stiff gray & tan clay w/silt pockets, trace of gravel, & trace of brick fragments	CH	2	5	32	89	117	UC	--	751				
					Wood	Wd	3	8	439									
10	0.50				Soft gray silty clay	CL	4	11										
15							5	14	38	83	115	UC	--	265				
20					Soft gray clay w/silt pockets & lenses	CH	6	19										
25							7	24	46	75	109	UC	--	331				
30	0.25				Medium stiff gray clay w/silt pockets & lenses	CH	8	29										
35	0.25						9	34	44	77	111	UC	--	667				
40					Very soft gray silty clay	CL	10	39										
45	0.50				Medium stiff gray clay w/silty sand lenses	CH	11	44	38	83	115	UC	--	529				
50					Very loose gray sandy silt	ML	12	49	26	98	123	OB	0	220				

NOTES:



The National World War II Museum
Hotel and Parking Garage

LOG OF BORING AND TEST RESULTS

B-7

EUSTIS ENGINEERING

New Orleans, Louisiana
Project No: 22300

Date: 09/11/2013 - 09/12/2013

Latitude: 29.94210

Longitude: -90.06998

Water Depth: See Text

Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPL R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50		18	X		Medium compact gray sandy silt	ML	13	50.5										SV
55		21	X		Medium compact gray clayey silt w/sandy silt	ML	14	53.5										
		19	X				15	56.5										
60		19	X				16	59.5										
65		38	X		Dense gray silty sand	SM	17	63.5										
70		39	X				18	68.5										
75		40	X				19	73.5										
80		30	X		Medium dense gray fine sand	SP	20	78.5										
85		42	X		Dense gray fine sand	SP	21	83.5										
90		50	X				22	88.5										
95		46	X				23	93.5										
100		44	X				24	98.5										

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/17/2013 - 09/18/2013

LOG OF BORING AND TEST RESULTS

B-8

Latitude: 29.94202
Longitude: -90.06943

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
0					9" Concrete													
					Stiff brown silty clay w/trace of gravel & trace of brick fragments	CL	1	0.75	20									
5	1.25				Stiff gray & tan clay w/silt pockets & brick fragments	CH	2	5	29									
	0.50				Stiff gray clay w/silt pockets	CH	3	8	42	80	113	UC	--	1041				
10	0.75				Soft gray sandy clay	CL	4	11	39	81	112	UC	--	416				
	0.75						5	14										
15					Medium stiff gray clay w/silt lenses	CH												
	0.50						6	18	43	78	112	UC	--	592				
20					Soft gray clay w/silt lenses & pockets	CH												
	0.75						7	23	60	65	104	UC	--	421				
25																		
	0.75						8	28										
30																		
	0.75						9	33	48	74	109	UC	--	423				
35					Medium stiff gray clay w/silt pockets & lenses	CH												
	0.50						10	38	38	80	110	OB	0	586				
40																		
	0.50						11	43										
45																		
					Loose gray silty sand	SM	12	46.5	32	89	118	OB	0	462				
50																		

NOTES:



EUSTIS ENGINEERING

The National World War II Museum
Hotel and Parking Garage

New Orleans, Louisiana
Project No: 22300

Date: 09/17/2013 - 09/18/2013

LOG OF BORING AND TEST RESULTS

B-8

Latitude: 29.94202

Longitude: -90.06943

Water Depth: See Text

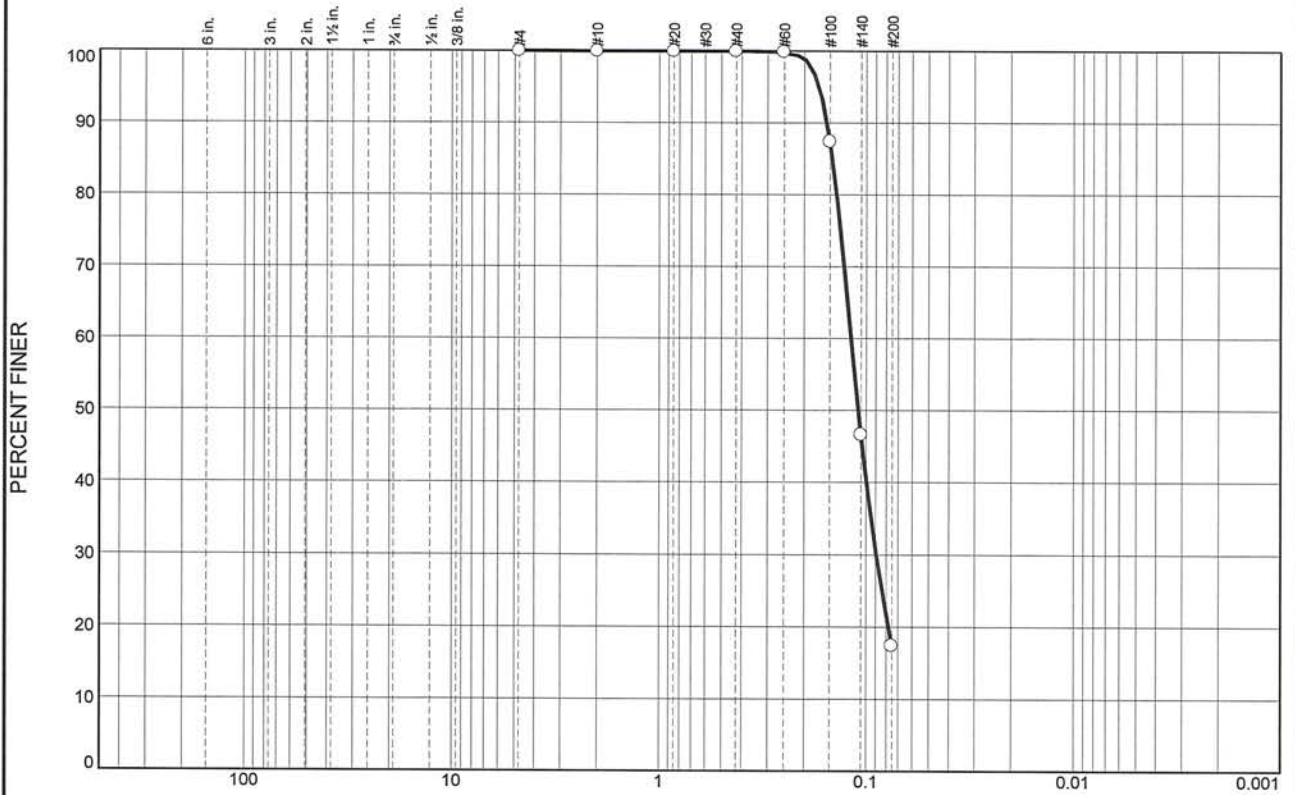
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPT R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits			Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI	
50		26	X		Medium compact gray clayey silt w/fine sand	ML	13	50										
		25	X				14	52										
55		24	X				15	56										-#200 = 74.7%
		25	X				16	59										
60																		
		29	X				17	64										
65																		
		26	X		Medium dense gray & tan silty sand	SM	18	69										
70																		
		26	X		Dense gray silty sand	SM	19	74										-#200 = 14.5%
75																		
		40	X				20	79										
80																		
		39	X		Very dense gray fine sand	SP	21	84										
85																		
		37	X				22	89										
90																		
		50	X				23	94										
95																		
		51	X				24	99										
100																		

NOTES:

EUSTIS GINT LIBRARY04102013.GLB EE STANDARD BORING LOG 22300.GPJ EE STANDARD DATATEMPLATE.GDT 10/7/13

Particle Size Distribution Report



GRAIN SIZE - mm.									
% +3"	% Gravel		% Sand			% Fines			
	Coarse	Fine	Coarse	Medium	Fine	Silt		Clay	
0.0	0.0	0.0	0.0	0.0	82.6	17.4			
LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		0.1460	0.1183	0.1092	0.0890				

Material Description							USCS	AASHTO
Medium Dense Gray Silty Sand W/ Trace of Concretion							SM	

Project No. 22300 Client: THE NATIONAL WORLD WAR II MUSEUM, INC., NEW Project: THE NATIONAL WORLD WAR II MUSEUM HOTEL AND PARKING GARAGE NEW ORLEANS, (ORLEANS PARISH), LOUISIANA Source of Sample: B-1 Depth: 66.5 Sample Number: 19	Remarks: Figure



Tested By: JFM

Checked By: CD

Particle Size Distribution Report



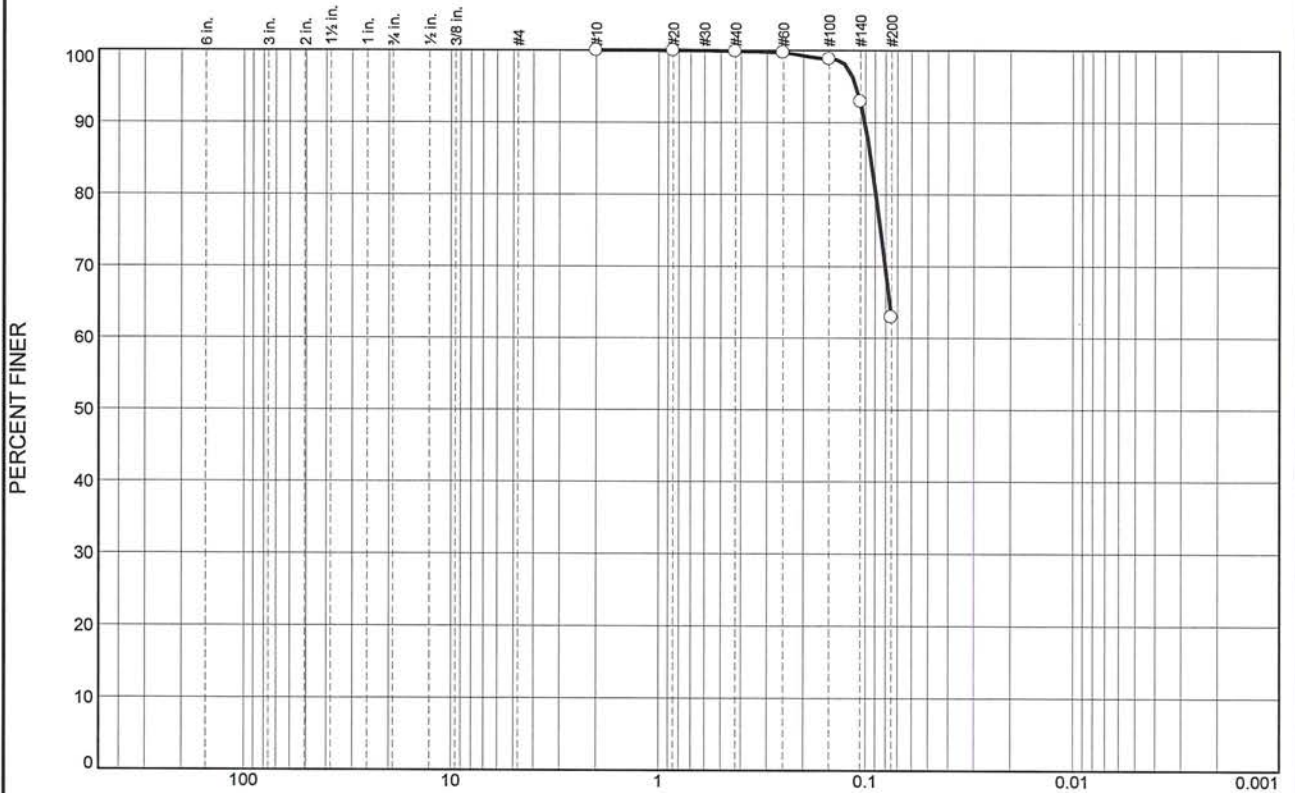
GRAIN SIZE - mm.									
% +3"		% Gravel		% Sand			% Fines		
		Coarse	Fine	Coarse	Medium	Fine	Silt		Clay
☐						56.3	43.7		
☒	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c
☐			0.1118	0.0867	0.0793				
Material Description								USCS	AASHTO
☐ Medium Dense Gray Silty Sand								SM	
Project No. 22300 Client: THE NATIONAL WORLD WAR II MUSEUM, INC., NEW Project: THE NATIONAL WORLD WAR II MUSEUM HOTEL AND PARKING GARAGE NEW ORLEANS, (ORLEANS PARISH), LOUISIANA ☐ Source of Sample: B-4 Depth: 53.5 Sample Number: 14								Remarks:	
 EUSTIS Metairie, Louisiana Lafayette, Louisiana Gulfport, Mississippi									

Figure

Tested By: JFM

Checked By: CD

Particle Size Distribution Report



GRAIN SIZE - mm.										
% +3"	% Gravel		% Sand			% Fines				
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
0.0	0.0	0.0	0.0	0.1	37.0	62.9				
LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u	
		0.0942								

Material Description							USCS	AASHTO
Medium Compact Gray Clayey Silt W/ Fine Sand							ML	

Project No. 22300 Client: THE NATIONAL WORLD WAR II MUSEUM, INC., NEW Project: THE NATIONAL WORLD WAR II MUSEUM HOTEL AND PARKING GARAGE NEW ORLEANS, (ORLEANS PARISH), LOUISIANA Source of Sample: B-7 Depth: 56.5 Sample Number: 15	Remarks: Figure
 EUSTIS Metairie, Louisiana Lafayette, Louisiana Gulfport, Mississippi	

Tested By: JFM Checked By: CD

SELECTIVE DEMOLITION

SECTION 02070

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Demolition of designated portions of the site, i.e parking paving, fence, gate, conduit, gas piping, etc. as indicated on the drawings and removal of materials from site. Protect existing trees and other items to remain.

1.02 RELATED WORK

- A. Limited cutting and patching of floors and walls for penetrations of piping, ducts, and conduits is included with the work of the respective mechanical and electrical specification sections in Divisions 15 and 16 and Section 01040 - Cutting and Patching including additional requirements for patching and repair work.

1.03 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of capped utilities.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control and runoff control.
- B. Obtain required permits from governing authorities.
- C. Do not close or obstruct roadways, sidewalks and hydrants without permits.
- D. Conform to applicable regulatory procedures when discovering hazardous or contaminated

materials.

- E. Notify the Environmental Protection Agency prior to any demolition work.

1.06 SUBMITTALS

- A. Schedule: Submit two copies of proposed methods and operations of demolition to the Architect for review prior to the start of work. Include in the schedule the coordination for shut-off, capping and continuation of utility services as required, and proposed dust control measures.
- B. Photographs of existing conditions of structures surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Architect prior to start of work.
- C. Record drawings at project closeout according to Division 1 Section "Contract Closeout".

1.07 JOB CONDITIONS

- A. Occupancy: The buildings immediately adjacent to areas of selective demolition will be occupied. Conduct selective demolition work in manner that will minimize need for disruption of the public's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations.
- B. Condition of Structures: The Owner assumes no responsibility for the actual condition of the items to be demolished.
 - 1. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner in so far as practicable. However, variations within the structure may occur by Owner's removal and salvage operations prior to the start of the demolition work.
- C. Traffic: Conduct demolition operations and the removal of debris to ensure minimum interference with adjacent occupied or used facilities.
- D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work. See Section 01010 for additional requirements.
 - 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
 - 2. Provide 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. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

- F. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
- G. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protections.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
 - B. General: Provide shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
 - 1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
 - C. Protect existing landscaping materials, appurtenances and structures which are not to be demolished.
 - D. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- .

3.02 GENERAL DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures and drives.
- B. Conduct operations with minimum interference to public or private accesses. Maintain egress and access at all times.
- C. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

- D. Protections: Provide temporary barricades, , and other forms of protection to protect personnel from injury and existing finishes from damage due to selective demolition work.
 - 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
 - 2. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
 - 3. Protect from damage existing finish work that is to remain in place during demolition operations.
 - 4. Protect floors with suitable coverings.

G,

3.03 SELECTIVE DEMOLITION

- A. General: 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.
- B. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.
- C. Remove from the site debris, rubbish, and other materials resulting from the demolition operations.
- D. If hazardous materials are encountered during demolition operations notify the Owner immediately. Comply with applicable regulations, laws, and ordinances concerning and protection against exposed or environmental pollution.
- E. Cleanup and Repair: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
- F. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work

3.04 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
- B. Patching is specified in Division 1 Section "Cutting and Patching".
- C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from the site debris, rubbish, and other materials resulting from the demolition operations.
- B. If hazardous materials are encountered during demolition operations notify the Owner immediately. Comply with applicable regulations, laws, and ordinances concerning and protection against exposed or environmental pollution.
- C. Burning of removed materials from demolished structures will not be permitted on the site.

3.06 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SOIL TREATMENT FOR TERMITE CONTROL

SECTION 02281

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Soil treatment for subterranean termite control for slabs, foundations and trenching of all areas of the buildings.

1.02 REFERENCES

- A. EPA - Environmental Protection Agency - Federal Insecticide, Fungicide and Rodenticide Act.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Indicate each toxicant to be used, composition by percentage, dilution schedule, intended application rate. Also include copy of guarantee.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Manufacturer's Installation Instructions: Indicate caution requirements.
- E. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements and indicate any deviations required to comply with governing codes and regulations including U.S. Environmental Protection Agency (EPA) regulations for termiticides and State of Louisiana requirements.

1.04 GUARANTEE

- A. Written guarantee shall certify that the applied soil poisoning treatment will prevent the infestation of subterranean termites and, that if subterranean termite activity is discovered during the guarantee period, the Contractor shall re-treat the soil and also repair or replace damage including contents caused by termite infestation.
 - 1. Warranty Period: 5 years from date of treatment, signed by the applicable, with two (2) year renewable option.
 - 2. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
 - 3. Contractor shall submit one week after Notice to Proceed the cost for the first annual renewal and shall guarantee that subsequent annual renewals will not exceed a cost calculated on a 5% compounded rate of increase of the first annual renewal fee.
 - 4. Within 12 months after initial treatment of the outside of the foundation, the perimeter wall shall be trenched and treated as required by label and labeling. The licensee shall report the completion of the application to the outside of the foundation to the Louisiana Department of Agriculture and Forestry on the Termite Perimeter

application form. Rodding will be acceptable where trenching may damage flowers and/or shrubs. Maximum distance between rod holes shall be 4 inches.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record moisture content of soil before application, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.06 QUALITY ASSURANCE

- A. Applicator: Company specializing in performing the work of this Section with minimum five (5) years documented experience, and licensed by the State of Louisiana.
- B. Use only termiticides that bear a federal registration number of the EPA and are approved by local and State authorities having jurisdiction including application rates.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code and regulations for requirements for application, application licensing, authority to use toxicant chemicals.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

1.08 SEQUENCING

- A. Apply toxicant within the 12 hours prior to installation of vapor barrier under slabs-on-grade and finish grading work outside foundations.
- B. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.
- C. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termites infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of the following chemical elements.
- B. Available Products: Subject to compliance with applicable regulatory agency requirements, products that may be incorporated in the work include, but are not limited to, the following:
 - 1. VERIFY ACCEPTABLE PRODUCTS WITH LOCAL AUTHORITIES PRIOR TO SUBMISSION TO ARCHITECT!

- C. Dilute with water to concentration level recommended by manufacturer.
- D. Other solutions may be used as recommended by the Applicator and if acceptable to the Architect. Provide only soil-treatment solutions which are not injurious to planting or people in concentrations used.

2.02 MIX

- A. Mix toxicant to manufacturer's instructions

PART 3 - EXECUTION

3.01 EXAMINATION/PREPARATION

- A. Verify that soil surfaces are sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.
- C. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

3.02 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply toxicant at locations indicated in Schedule at end of Section.
- C. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- D. Re-treat disturbed treated soil with same toxicant as original treatment.
- E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit soil grading over treated work.

3.04 SCHEDULES

- A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.
- B. Application Rates: Apply soil treatment solution as recommended by the manufacturer and maximum permitted by the applicable governing agencies

END OF SECTION

EARTHWORK**SECTION 02300****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes:
 - 1. Site Preparation
 - 2. Excavation
 - 3. Backfill
 - 4. Fill

1.03 DESCRIPTION OF WORK

- A. Extent of earthwork is shown on the drawings.
- B. Contractor shall produce a Storm Water Pollution Prevention Plan (SWPPP) as required by the City of New Orleans.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. The Owner will employ an Independent Testing Laboratory to conduct all inspections and testing of fill materials and compaction of fill and backfill.
 - 1. The testing lab shall be in compliance with ASTM E 329 “Standard Specification for Agencies Engaged in Construction Inspection and/or Testing” and ASTM D 3740 “Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction”.

1.05 JOB CONDITIONS

- A. Existing Utilities: Locate existing underground utilities, if any, in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

- 3. Coordinate with utility companies for shut-off of services if lines are active.
- B. Use of Explosives: The use of explosives is not permitted.
- C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
- D. Protect structures, utilities, sidewalks, pavements, earthwork activities, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Fill Material: Select granular material, such as locally available sand, shall be used as backfill and/or fill required to reach design grade. Sand fill shall be non-plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve. Prior to transporting this fill to site, a sample shall be tested by the Owner's Independent Testing Laboratory to verify its conformance to these requirements.

2.03 GEOTEXTILE FABRIC

- A. Geotextile Fabric shall be Mirafi 600X or approved equal.

PART 3 - EXECUTION

3.01 SITE PREPARATION

- A. Establish adequate drainage to prevent ponding of water and ensure immediate runoff of all rainfall. Should areas of ponding water develop, the Contractor shall immediately pump ponding water away from areas of construction.
- B. Clearing and Stripping: The existing ground surface shall be stripped of any vegetation, loose topsoil, debris stumps, organic matter, loose fill, and any other deleterious materials. Stripping shall be to the minimum depth necessary to remove any vegetation and roots. Deeper excavations may be required in the vicinity of stumps or demolition debris. The exact depth of stripping shall be determined during construction by a representative of Owner's Independent Testing Laboratory.
- C. Demolition: Provisions shall be made to locate any abandoned underground utilities and foundations which could impact new construction. Existing footings and abandoned pipes shall be removed from site. Voids and dips left by these excavated items shall be proof rolled and backfilled with structural fill material. Existing piles beneath pile supported features shall be cut off at least 2 feet below the pile supported foundations. Existing piles beneath areas of paving features shall be cut off at least 3 feet below the bottom of pavement. Removal of excavated structures shall also conform to Section 202 of the Louisiana Standard Specifications for Roads and Bridges, latest edition.

- D. After stripping and clearing operations, the exposed surface shall be proof rolled with a loaded tandem axle dump truck. The vibratory system on the compactor, if present, shall not be used during proof rolling. Any depressions, stump holes, or weak areas identified shall be thoroughly cleaned out to the surface of firm, undisturbed soil and backfilled with a select structural fill material placed and compacted under controlled conditions. All clearing and compaction operations shall only be performed during periods of dry weather. Proof rolling operations shall be witnessed by a representative of the Owner's Independent Testing Laboratory. Motorized wheeled equipment shall not be allowed within the foundation area during periods of inclement weather.

3.02 EXCAVATION

A. Shoring and Bracing:

1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
2. Establish requirements for shoring and bracing to comply with local codes and authorities having jurisdiction.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
4. Provide permanent steel sheet piling or pressure treated timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures, paving, etc. Cut off tops are required and leave permanently in place.

B. Dewatering:

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
3. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
4. Dispose of excess soil material and waste materials as herein specified.

C. Excavation for Structures:

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form work, installation of services other construction, and for inspection.
2. In excavating for footings and other subgrade construction, take care not to disturb bottom of excavation. Trim bottoms to required lines and grades to leave solid base to

receive concrete.

D. Excavation for Trenches:

1. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room.
2. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
3. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of pipe.
4. Backfill trenches with concrete where trench excavations pass within 18" of soil supported column or wall footings which are carried below the bottom of such footings, or which pass under wall footings. Otherwise compact as required for adjacent soil. Concrete is specified in Division 3.
5. Do not backfill trenches until tests and inspections have been made. Use care in backfilling to avoid damage or displacement of pipe systems.

E. Cold Weather Protection:

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.03 COMPACTION

- A. Structural fill beneath areas of paving and non-pile supported foundations shall be placed in maximum lifts of 8 inches and compacted to 95% of its maximum dry density near optimum moisture (-1% to +3%) in accordance with ASTM D 698. Placement of all fill shall be witnessed by a representative of the Owner's Independent Testing Laboratory. Structural fill material shall be certified and approved by the Owner's Independent Testing Laboratory prior to its use.
- B. Structural fill used as backfill or form fill beneath pile-supported features shall be placed in lifts of 8 to 10 inches and compacted to at least 95% of its maximum dry density, near optimum moisture, in accordance with ASTM D1557 using a portable compactor. Compaction over small footprints and tightly congested areas may be performed with a hand tamper or other suitable equipment. Fill material placed within two feet of the bottom of any general area paving should be placed in 6 to 8-inch lifts and compacted to 95% of ASTM D1557. All clearing and compaction operations shall only be performed during periods of dry weather and shall be witnessed by a representative of the Owner's Independent Testing Laboratory. Motorized wheeled equipment shall not be allowed within the foundation area during periods of inclement weather.
- C. Moisture Control:
1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material.
 2. Remove and replace soil material that is too wet to permit compaction to specified density.

3.04 BACKFILL AND FILL

- A. General: Place fill or satisfactory excavated material in layers to required subgrade elevations.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Acceptance by Architect of construction below finish grade.
 - 2. Inspection, testing approval, and recording locations of underground utilities.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures or remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
 - 5. Removal of trash and debris.
 - 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.05 FIELD QUALITY CONTROL

- A. Quality Control Testing during Construction: Allow Owner's Independent Testing Laboratory to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. The in-place density and water content shall be determined by the independent testing laboratory by using the ASTM D6938-10 Standard Test Method.
 - 1. Utility Trenches - One compaction test per 100 linear feet of each lift and a minimum of one test between utility structures (catch-basin, manholes, etc.) per lift.
 - 2. Under areas of paving – For areas under 5,000 S.F., two compaction tests per 2,500 S.F. for each lift is required. For areas that exceed 5,000 S.F., two compaction tests per 5,000 S.F. for each lift is required.
 - 3. In instances where multiple tests are required, the test locations shall be selected by the Engineer of Record to provide the maximum available distance between the test locations.
- B. Rejection of Compacted Materials: If in opinion of Owner's Independent Testing Laboratory, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove trash debris, excess excavated material and waste materials and lawfully dispose of it off the Owner's property at regular intervals. Do not allow materials to accumulate on site in a manner that would hamper dewatering operations.

END OF SECTION

AUGERED CAST-IN-PLACE PILES

SECTION 02350

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to the work of this Section.
- B. Section 31 20 01 “Earthwork for Building Foundations”, for required site preparation work to be completed prior to installation of Contract piles.
- C. Section 01 35 20- “LEED Requirements”.
- D. Section 01 43 00 “Structural Tests and Special Inspections”.

1.2 SUMMARY

- A. This Section specifies the following:
 - 1. Installation of 16" diameter piles augered to a tip elevation of (-)78'-0”.
 - 2. Quality control requirements for the installation of piles.
 - 3. Final cutoff of piles.
 - 4. Supply and installation of reinforcing steel for piles.

1.3 PILE CONTRACTOR QUALIFICATIONS

- A. All piles shall be installed by an experienced Pile Contractor who shall submit evidence of not less than ten successful installations of augered cast-in-place piles under similar job and subsurface conditions. These similar conditions shall exhibit soils characteristics similar to those contained within the Project Soils Report and shall be within the Greater New Orleans Area.
- B. Contractor Experience:
 - 1. The Piling Contractor shall submit a list of a minimum of three projects successfully completed in the two year period preceeding the bid date in which augered cast-in-place piles were installed successfully under subsurface and project conditions similar to those of the current project.
 - 2. The Piling Contractor shall submit the credentials of the proposed designated job site supervisor (foreman or crew chief) having a minimum of five years of experience in the supervision of the installation of the auger cast-in-place piles.
 - 3. The Piling Contractor shall submit the credentials of the drill rig operator, having a minimum of three years experience installing auger cast-in-place piles.
 - 4. The Piling Contractor shall submit the credentials of the designated project manager, having a minimum of three years experience installing auger cast-in-place piles
 - 5. Submit a list of all other pile installation and support personnel to be used on the project and provide documentation of experience.

1.4 PILE LAYOUT

- A. All piles shall be staked-out in the field by a Louisiana licensed surveyor.
- B. Following the installation of all exploratory piles and reaction piles, the General Contractor shall provide a survey prepared by a Louisiana licensed surveyor of the locations of the exploratory piles and reaction piles. The Contractor shall submit this survey to the Owner, Architect, and Engineer of Record.

1.5 SYSTEM DESCRIPTION

- A. Augered cast-in-place piles shall be made by rotating a continuous flight hollow-shaft auger into the ground to the specified pile depth. Grout shall then be injected through the auger pile, as the auger is being withdrawn, in such a way as to exert a positive upward grout pressure on the earth filled auger flights as well as a positive lateral pressure on the soil surrounding the grout filled pile hole.

1.6 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. C109 Compressive Strength of Hydraulic Cement Mortars.
 - 2. C150 Portland Cement
 - 3. C494 Chemical Admixtures for Concrete
 - 4. C33 Concrete Aggregates
 - 5. C618 Fly Ash for Use in Concrete

1.7 SUBMITTALS

- A. Equipment: Description of the pile drilling and pumping equipment to be utilized.
 - 1. An augering rig with a cab-mounted display of augering parameters is required.
 - 2. Submit the sizes of proposed equipment, including drilling rigs, augers and other drilling tools, pumps for grout or concrete, mixing equipment, automated monitoring equipment, and similar equipment to be used in construction, including details of procedures for calibrating equipment as required.
 - a. Diameter of augering flights shall be at least 97% of the pile diameter.
 - 3. Submit automated monitoring equipment, including manufacturer, data to be collected, current calibration records, and sample data records. As a minimum, the the monitoring equipment shall have the capability to monitor and record the following:
 - a. Torque delivered to the auger
 - b. Crowd force (downward thrust on auger), if applicable to the equipment in use.
 - c. Volume of grout or concrete during operation, per increment specified.
 - d. Maximum and minimum operating grout pressure for each specified increment.
 - e. Auger rotation during operation.
 - f. Depth of the injection point during operation.
 - g. Rate of grout flow per specified increment.
 - h. Depth or corresponding volume of pre-withdrawal grout head

- i. Depth of auger at which grout return reaches grade
- B. Mix Designs: Submit written reports of proposed pile grout mix. The Owner's Independent Testing Laboratory shall review proposed grout mix designs for compliance with the Construction Documents. Submitted mix design shall include review letter, as prepared by the Owner's independent testing lab, stating that the mix design meets the project requirements.
- C. Reports:
 - 1. Furnish certified test reports for all grout materials.
 - 2. Furnish certified mill test reports for all reinforcing steel.
 - 3. Furnish independent testing laboratory reports of test and inspections as required in this section.
- D. Records:
 - 1. Submit two copies or electronic copy of the installation record of each pile not later than one day after installation is completed, for review by the Owner's Independent Testing Laboratory. The submittal shall be directed to the Engineer of Record and shall copy the testing lab and Architect simultaneously. Include in the record, the project name and number, name of contractor, pile location and design pile capacity, pile diameter, tip elevation, elevation of butt, drilling elevation, quantity of grout placed, pile reinforcing steel, and any unusual occurrence during the pile installation. The grout quantity shall be determined by recording grout pump displacement or by other acceptable means.
- E. Pile installation sequence plan.
 - 1. Submit the sizes of proposed equipment, including drilling rigs, augers and other drilling tools, pumps for grout or concrete, mixing equipment, automated monitoring equipment, and similar equipment to be used in construction, including details of procedures for calibrating equipment as required.
 - 2. Submit a step by step description of the pile installation procedures to be used on the specific project.
 - 3. Submit a plan of the sequence of pile installation.
 - 4. Following the completion of the test pile program, submit target drilling and grouting parameters (along with acceptable ranges) for pile installation, including auger rotation speed, drilling penetration rates, torque, applied crowd pressures when applicable, grout pressures, and grout volume factors.
 - 5. Submit details of methods of reinforcement placement, including support for reinforcing cages at the top of the pile and methods for centering the cages within the pile or concrete column.
 - 6. Submit mix designs, with testing lab review letters described above, for all grout or concrete to be used on the project, including slump loss vs. time curves and strength development vs. time curves for mixes with fly ash and/or slag.
 - 7. Submit equipment and procedures for monitoring and recording auger rotation speed, auger penetration rates, auger depths, and crowd pressures during installation.
 - 8. Submit equipment and procedures for monitoring and recording grout or concrete pressures and volumes placed during installation.
 - 9. Submit contingency plans for equipment failures during drilling or grouting operations

(grout pump, monitoring equipment, etc.). Include re-drilling procedures in compliance with the project requirements.

10. The installation plan shall include documentation that the proposed drilling equipment has been demonstrated effective on similar size piles in similar soil conditions.
11. Submit the materials and procedure to be used for extending piles above grade, if applicable, for project piles.

F. LEED Submittal:

1. Product Data for LEED credits:
 - a. Product Data meeting the minimum requirements of LEED v4.1 Option 4 Whole-Building Life-Cycle Assessment.
 - b. Refer to Section 01 35 20 for minimum recycled content of materials, regional material and low-emitting materials requirements.

G. Testing Sequence Plan Submittal:

1. See Quality Assurance 1.8.A.1
2. Submit intended schedule for performing each type of test specified. Include amount of time needed for processing of data, presentation of data and time required for pile preparation prior to testing, including concrete setting time, and time for preparation of piles for testing.

H. TIP testing Consultant credentials:

1. The Consultant qualifications and the specifications for the equipment used shall be submitted to the Engineer for approval prior to beginning augered cast-in-place pile installation.

1.8 QUALITY ASSURANCE

A. Tests, inspections and services to be performed by the Owner's Independent testing laboratory or geotechnical consultant.

1. Quality control of augered cast-in-place pile (ACIP) installations shall include nondestructive testing of the completed piles including Thermal Integrity Profiler (TIP) Testing of 5% of the contract piles and all of the exploratory piles. Sensor diodes shall be placed at 5 foot increments along the length of wire
 - a. 5% testing to be constituted by valid test results only. Any tests which produce inconclusive results shall be redone at the cost of the contractor.
 - b. Test locations shall be randomly determined each day by the testing lab. The contractor shall not be notified of the pile locations prior to their placement, so as to produce results which are representative of the balance of installed piles.
2. A set of six grout cubes shall be taken from each grout delivery for the first three days and then twice per day after it has been shown that grout mixes are adequate. Compressive tests shall be performed on two cubes of the set at 7, 28, and 56 days (reference ASTM C109 and Corps of Engineers CRD-C 620)
4. Flow cone measurements shall be made on each grout delivery after any water is added to

the mix at the site with an acceptable flow being between 10 seconds and 25 seconds. Slump range shall measure 8" ±1" in accordance with ASTM C 939 (reference Corps of Engineers CRD-C611).

5. The grout pump shall be calibrated and the number of strokes required for a pile installation which includes a volume of grout above the theoretical volume due to densification of the soils from grout pressure and due to waste shall be established and compared to the actual number of strokes during construction.
 6. Observe the installation of all piles, record appropriate data and issue daily reports to the Owner, Architect, Structural Engineer and Contractor. The testing laboratory shall furnish a registered design professional, who is knowledgeable in the field of soil mechanics and deep foundations, who is responsible for the review of logged pile data. Potential defects or anomalies shall be noted in the daily reports by the testing laboratory. The testing laboratory's registered design professional shall submit a report to the Owner, Architect, Engineer, and Contractor, stating that the elements were installed in compliance with the Construction Documents.
 7. Additional Tests: The Architect reserves the right to require additional tests to those specified or upon materials not herein specified for testing. If such tests are necessary because of defective materials or workmanship, the cost of these additional tests shall be borne by the Contractor.
- B. Testing Laboratory Daily Report: The Owner's Independent Testing Laboratory shall include the following installation records in a daily report, to be issued no later than the morning after augering and casting piles completed within the span of a work day.
1. Pile location, and plumbness.
 2. Ground surface elevation.
 3. Pile toe (bottom) depth/elevation.
 4. Depth/Elevation of top of grout/concrete.
 5. Pile length.
 6. Auger diameter.
 7. Details of reinforcing steel (number, size, and grade of longitudinal bars, size and spacing of transverse steel; outside diameter and length of cage).
 8. Flow cone efflux time and volume of grout placed, or slump and volume of concrete placed
 9. Theoretical volume of excavation (theoretical diameter=diameter of auger)
 10. Depth and corresponding volume of grout head prior to withdrawal of auger.
 11. Depth of auger when grout return is seen at ground surface.
 12. Depth/Elevation to which reinforcing steel was placed.
 13. Date/Time of beginning of drilling.
 14. Date/Time of completion of drilling.
 15. Date/Time grout or concrete was mixed.
 16. Date/Time ready-mix grout or concrete truck arrived at project site, and copies of all grout or concrete batch tickets used for the pile construction.
 17. Date/Time of beginning of grout or concrete pumping.
 18. Date/Time of completion of grout or concrete pumping.
 19. Date/Time of placement of reinforcing steel.
 20. Weather conditions, including air temperature, at time of grout or concrete placement.
 21. Identification of all grout or concrete samples taken from the pile.
 22. All other pertinent data relative to installation.
 23. All readings made by the automated measuring and recording equipment to include as a minimum:
 - a. Auger rotation vs. depth for every 5 foot increment, or less, of pile advancement

- during the drilling process, and during placement of grout or concrete (if auger rotated during this placement).
 - b. Volume of grout or concrete placed versus depth of outlet orifice for every 5 foot increment, or less, of pile placed.
 - c. Average maximum and minimum pump stroke pressures at ground level for every 5 foot increment, or less, of pile placed.
 - d. Average maximum and minimum pump stroke pressure at or near the auger head for every 2-5 foot increment, or less, of pile placed, if directed by the Engineer.
 - e. Additionally, the engineer may also specify that the torque and crowd force (downward thrust on auger) measurements be made at every 5 foot increment, or less, of pile advancement during the drilling process, if applicable.
- C. Thermal Integrity Profiler (TIP) Testing: Using the TIP Thermal Wire method, the Owner's Testing Lab, or an appropriate professional under their supervision, shall act as project TIP Consultant, and conduct testing between 12 and 48 hours following casting of the pile.
 - 1. Qualifications of TIP Consultant. The TIP consultant shall have a licensed professional engineer supervising the testing and interpretation of results. The TIP Consultant shall be an independent testing agency with documented and approved experience in TIP testing.
 - 2. Assistance by the augered cast-in-place pile Contractor to the TIP testing consultant. The Contractor shall provide cooperative assistance, suitable access to the site and augered cast-in-place piles to be tested, and labor as required to assist the TIP Consultant in performing the required tests. Prior to testing, provide the augered cast-in-place pile lengths, and dates of installation of augered cast-in-place pile to the TIP Consultant and coordinate with TIP Consultant to install the necessary TIP instrumentation prior to immediately after removal of auger from ground.
 - a. Prior to start of TIP testing work, a meeting shall be conducted between the Owner, Architect, Engineer of Record, TIP Consultant, and Contractor, in order to confirm and coordinate all TIP requirements.
 - 3. Equipment requirements for TIP: Provide a Thermal Integrity Profiler (TIP) manufactured by Pile Dynamics, Inc., (30725 Aurora Rd., Cleveland Ohio 44139, USA, phone: +1 216-831-6131; fax +1 216-831-0916, www.pile.com), or equivalent equipment. The equipment shall have the following minimum requirements:
 - a. A computer based TIP data acquisition system to monitor temperature versus time after casting.
 - b. Ability to collect data at user defined time intervals (typically 15 to 60 minutes).
 - 4. Pile preparation for thermal wires: Install one (1) thermal wire in each augered cast-in-place pile. Pre-test all wires for continuity across full length of wire prior to installing in pile.
 - 5. The number of augered cast-in-place piles to be tested by TIP is 5% of all contract augered cast-in-place piles, and 100% of exploratory augered cast-in-place piles. Piles will be selected by the Owner's Testing Lab at the time of installation. Tested piles are considered as piles for which conclusive information is provided by the testing.
 - 6. If significant defects are detected, the number of augered cast-in-place piles tested may be increased by the Engineer of Record. Contractor shall furnish additional costs for testing at no additional cost to the Owner.
 - 7. Thermal wires shall be aligned with the longitudinal reinforcement of the pile, and stretched to minimize the wire slack. The wires shall be tied at a maximum of every 3 ft to the reinforcement at a location on the reinforcement that is 90° to the line connecting the reinforcement to the center of the pile. One additional bar and wire shall be held in reserve at all times so that wires with discontinuities can be readily replaced.

8. Thermal wires shall be connected to a Thermal Access Port (TAP) immediately after inserting wires in cast pile. Data shall be collected by the TAP at intervals of time specified by the Engineer every 15 to 60 minutes for 12 to 48 hours, or as recommended by the TIP Consultant. After completion of the data collection period, the TAP shall be connected to the main TIP data acquisition unit and the data files shall be downloaded for inspection of temperatures versus depth. Potential local defects indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths, shall be immediately reported to the Engineer of Record.
9. TIP results: Results of the TIP shall be presented in a written report within (5) working days of completion of testing. The report shall present results of TIP tests by including:
 - a. Graphical displays of all temperature measurements versus depth.
 - b. Indication of unusual temperatures, particularly significantly cooler local deviations of the average at any depth from the overall average over the entire length, in thermal wire measurements.
 - c. The overall average temperature.
 - d. Variations in temperature between wires (at each depth) which in turn correspond to variations in cage alignment. Where concrete volume is known, the cage alignment or offset from center should be noted.
 - e. Where pile specific construction information is available (e.g. elevations of the top of pile, bottom of casing, bottom of pile, etc.), these values shall be noted on all pertinent graphical displays.

1.9 PROJECT SITE CONDITIONS

- A. Available Data - 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 or conclusions drawn therefrom by Contractor. Data are made available for the convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to the Owner.
- B. Contractor Responsibility - The Contractor is required to visit the site prior to the submission of bids. Contractor shall investigate the existing adjacent buildings, sewers, and utilities and shall take proper and necessary precautions to protect same from damage due to the execution of the piling work. Should damage occur due to Contractor's negligence, the cost and responsibility for repairing or replacing the work in its original condition shall be borne by the Contractor at no cost to the Owner.
- C. Vibration Study: During the installation of all piles, and movement of rigs and equipment across the site, the laboratory shall monitor and record the vibrations to adjacent and surrounding areas. The laboratory shall employ the services of a vibration specialist engineer who in conjunction with the laboratory shall render complete reports and interpretations of the data obtained, including the possible effects of the measured vibrations on adjacent and surrounding structures. The vibrations shall be measured by means of a portable Seisomograph which directly measures particle velocity (rate of ground movement) in three mutually perpendicular directions (longitudinal, transverse, and vertical). Probes shall be located at various locations as directed. A complete report of the vibration study, including seismograms, shall be furnished after the conclusion of the driving of these piles. Peak particle velocities, measured at the surface, shall not exceed 0.25 inches per second. Should this limit be exceeded,

pile driving operations and/or equipment movement shall be paused, and the Engineer of Record shall be contacted in order to coordinate a method to reduce vibration.

1.10 NOTIFICATION

- A. Installation: Notify Architect and Engineer of Record 72 hours prior to installing first pile.
- B. Inspection: Notify independent testing laboratory prior to installing piles. Do not conduct any operations in the absence of their representative.

1.11 DAMAGE TO EXISTING PROPERTY

- A. Preconstruction Photographs: Contractor shall inventory and record the condition of the adjacent structures. Contractor shall also inventory and record the condition of the underground utilities and other construction in the area described above. Provide photographs of conditions that might be misconstrued as damage caused by pile installation activities. Photographs must be of quality and detail to clearly document all pre-existing conditions of the adjacent structures with respect to structural foundations, building cracking/shifting, etc. Contractor is required to obtain adjacent property owner's authorization to photograph exterior and interior pre-existing conditions. Exterior photographs must be documented with vegetation and other visual barriers avoided. Photographs to be taken behind vegetation and barrier shall have appropriate detail and lighting control to view conditions clearly.

Photographs must have "date imprint" visible on photographic image to verify date of recording.

- B. All damages to existing facilities or any other damage resulting from the piling operation must be repaired or renewed by the Contractor without cost to any other party.
- C. The project survey information shall not preclude the Contractor from performing the required investigative work prior to piling installation to verify clearance from underground utilities.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Portland Cement: Portland Cement shall conform to current ASTM standards, designation C 150.
- B. Mineral Admixture: Mineral admixture, if used, shall be flyash or natural pozzolan which possesses the property of combining with the lime liberated during the process of hydration of Portland Cement to form compounds containing cementitious properties. The material shall conform to ASTM C 618, Class C.
- C. Fluidifier: Fluidifier shall be a compound possessing characteristics which will increase the fluidity of the mixture, act as a water reducing agent and retardant.

- D. Water: Water shall be potable, fresh, clean and free of sewerage, oil, acid, alkali, salts or organic matter.
- E. Fine Aggregate: Sand shall meet the requirements of current ASTM standards designation C 33.
- F. Reinforcing Bars: All piles shall be reinforced as indicated on the drawings, and conform to the requirements of ASTM A 615, Grade 60.
 - 1. Recycled Content of Steel Products: Provide steel products with an average recycled content so that post-consumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.
 - 2. Reinforcing Bar Fabrication: Reinforcing steel assemblies shall be detailed and fabricated in accordance with the manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315—latest edition). Centralizers or other acceptable methods shall be provided to facilitate proper centering of any steel cores or reinforcing installed in the piles.
- G. Grout Mixes: The grout shall consist of Portland cement, sand and water, and may also contain a mineral admixture and approved fluidifier. The components shall be proportioned and mixed to produce a grout capable of maintaining the solids in suspension, which may be pumped without difficulty and which will penetrate and fill open voids in the adjacent soils. These materials shall be proportioned to produce a hardened grout which will achieve the design compressive strength of 4000 p.s.i. at 28 days. All material shall be accurately measured by volume or weight as they are fed to the mixer. Time of mixing shall be not less than one minute at the site. If agitated continuously, the grout shall be held in the mixer or agitator for a period not exceeding two and one-half hours at higher temperatures, not exceeding 100 degrees F. Grout shall not be placed when its temperature exceeds 100 degrees F. In accordance with ACI 305/306, the grout shall be protected from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, or from damage during high temperatures.
- H. Vertical Bar for Insertion of Thermal Wire: Each pile identified to have TIP test performed shall have a 78'-0" long minimum #8 rebar or equivalent placed vertically in the center of the auger-cast pile, for attachment of the thermal sensing wire.

2.2 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mix for grout required.
- B. Design mix shall be reviewed by the Owner's independent testing laboratory.
- C. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project for the type of grout required.
- D. Produce grout consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
 - 1. Compressive strength at 28 days: 4,000 p.s.i. minimum.

- E. Cure compression test cubes using same methods as used for production piles.
- F. Submit written reports to Architect and Owner's Testing laboratory of proposed mix for grout at least 15 days prior to start of exploratory pile installation. Do not begin pile installation until mixes and evaluations have been submitted to Architect and approved by the Laboratory.
- G. Adjustment to Grout Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Owner's Laboratory before using in the work.

PART 3 – EXECUTION

3.1 GROUT PREPARATION

- A. All materials shall be accurately measured by volume or weight as they are fed to the mixer. Time of mixing shall be not less than one minute at the site. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding two and one-half hours at grout temperatures below 70 degrees F. and for a period not exceeding two hours at higher temperatures, not exceeding 100 degrees F. Grout shall not be placed when its temperature exceeds 100 degrees F.
- B. Protect grout from physical damage or reduced strength which could be caused by frost, freezing actions or low temperatures or from damage during high temperatures in accordance with ACI 305/306.
- C. Test the flow of each batch of grout.

3.2 EQUIPMENT

A. Augering Equipment:

1. The length of the auger brought to the project site shall be such that the auger is capable of installing a pile to a depth that is 20% greater than the depth of the pile shown on the Contract Documents.
2. The auger flighting shall be uniform in diameter throughout its length, and the outside diameter of the auger shall be at least 97% of the design diameter of the pile.
3. The auger flighting shall be continuous from the auger head to the top of auger without gaps or other breaks. The auger flighting shall be uniform in diameter throughout its length and shall be the diameter specified for the piles.
4. The hole through which the grout is pumped during the placement of the pile shall be located at the bottom of the auger head below the bar containing the cutting teeth.
5. Augers over 40 feet in length shall contain a middle guide.
6. The piling leads shall be prevented from rotating by a stabilizing arm or by firmly placing the bottom of the leads into the ground or by some other acceptable means. Leads shall be marked for one foot intervals to facilitate measurement of auger penetration.

B. Mixing and Pumping Equipment:

1. Only approved pumping and mixing equipment shall be used in the preparation and handling of the grout. A screen to remove oversize particles shall be placed at the pump inlet. All oil or other rust inhibitor shall be removed from mixing drums and grout pumps. All materials shall be such as to produce a homogeneous grout of the desired consistency.
2. The grout pump shall be a positive displacement pump capable of developing displacement pressures at the pump not less than 350 psi. The grout pump shall be provided with a pressure gauge in clear view of the equipment operator. The grout pump shall be calibrated at the beginning of the work to determine the volume of grout pumped per stroke. A positive method of counting grout pump strokes shall be provided by the Pile Contractor. Such methods may include digital or mechanical stroke counters or other acceptable methods. A second pressure gauge, if required, shall be provided close to the auger rig where it can be readily observed by the Inspector, if required.

3.3 INSTALLATION PROCEDURE

- A. The drilling criteria of piles is indicated herein and on the Drawings.
- B. Installation of the piles shall not begin until completion of the paving demolition, fill placement and site preparation, as indicated in Section 31 20 01 “Earthwork for Building Foundations”.
- C. Advance the auger at a continuous rate that prevents removal of excess soil. Stop advancement after reaching the required depth.
- D. The hole in the bottom of the auger shall be closed with a suitable plug while being advanced into the ground. The plug shall be removed by grout operation.
- E. At the start of pumping grout, raise the auger from 6 to 12 inches and after the grout pressure builds up sufficiently, redrill the auger to the previously established tip elevation.
- F. A grout head of at least five feet of grout on the auger flighting above the injection point shall be maintained during raising of the auger. Positive rotation of the auger shall be maintained at least until placement of the grout. Rate of grout injection and rate of auger withdrawal from the soil shall be coordinated so as to maintain at all times the minimum grout head. The total volume of grout shall be not less than 130 percent of the theoretical volume for each pile. Grout volume, as installed during the test pile program, shall be maintained throughout all job pile installations at no additional cost to the owner. After grout is flowing at the ground surface from the auger flighting, the rate of grout injection and auger withdrawal shall be coordinated so that there is a constant grout flow at the surface. If pumping grout is interrupted for any reason, the Contractor shall reinsert the auger by drilling at least five feet below the tip of the auger when the interruption occurred, and then regrouting.
- G. If less than 130 percent of the theoretical volume of grout is placed in any five-foot increment until the grout head on the auger flighting reaches the ground surface, the pile shall be reinstalled by advancing the auger 10 ft. or to the bottom of the pile if that is less, followed by controlled removal and grout injection. If greater than 130 percent of the theoretical grout volume is utilized during the test pile program, the actual volume utilized shall be maintained throughout all job pile installations for each five-foot increment, at no additional cost to the owner.

- H. If more than 130% of the theoretical grout is placed, the additional grout shall not incur additional cost to the owner and shall be considered as part of the ACIP contractor's materials cost in installing the specified job pile.
- I. The grout volume of the project piles shall be at least the volume of the tested exploratory pile and at least 130% of the theoretical volume. Under no circumstance, without prior written consent of the owner and Engineer of Record, shall the installed grout volume be less than 130%.
- J. All spoil that accumulates around the auger during drilling and injection of the grout shall be promptly cleared away and removed from the jobsite.
- K. Cutoff piles on a neat horizontal plane without damaging pile and remove cutoff portions from the jobsite.
- L. Install reinforcing bars in the piles as indicated on the Drawings. Methods acceptable to the Architect shall be provided to facilitate proper centering of reinforcing installed in the piles.
- M. Auger hoisting equipment which will enable the auger to be rotated while being withdrawn shall be provided.

3.4 ADJACENT PILES

- A. Piles shall not be installed within six (6) pile diameters center to center from an adjacent cast pile that is less than 24 hours old, or an adjacent cast concrete element that is less than 24 hours old.

3.5 LOCATION

- A. Piles shall be installed plumb and accurately into position as shown on Drawings. A maximum variation not exceeding 3" for each pile will be accepted as fulfillment of contract, providing limiting and controlling conditions make it impossible to maintain more accurately the spacing indicated on the Drawings. Maximum tolerance from the vertical for vertical piles shall be 1.5 feet in 100 feet. The piles in each cluster shall be plotted by the Contractor for the next phase of work and submitted to the Architect. If required, sufficient piles shall then be added at locations determined by the Architect. The Contractor shall, at his own cost, install such additional piling and/or pay for altering pile caps as may be required to compensate for or to rectify the conditions brought about by failure to preserve proper spacing, whenever this defect is discovered.

3.6 DEFECTIVE PILES

- A. Any pile installed too low to permit proper cut-off must be corrected at the Contractor's expense. Any pile which is damaged or deflected or any pile which cannot be installed to proper tip penetration because of interference by underground obstructions shall be replaced with an acceptable substitute pile (or piles) at the location(s) determined by the Architect.
- B. The Engineer of Record shall reject piles deemed defective based on independent testing laboratory review and the results of specified testing procedures. The cost for replacement, or repair, of any defective pile is the responsibility of the Contractor and shall be completed at no

additional cost to the Owner.

3.7 MISSING PILES

- A. Contractor shall be held responsible for any pile which is missing or omitted. Missing piles, no matter the stage of work at which they are discovered, shall be replaced without extra cost to the Owner.

3.8 INSPECTION

- A. The Owner's Independent Testing Laboratory will furnish a representative to inspect the pile installation operation. The Contractor shall cooperate with the inspector in the performance of this work. The presence of the inspector shall in no way relieve the Contractor of his obligation to perform the pile installation in accordance with the Contract Drawings and these Specifications.

END OF SECTION 316200

BRICK PAVING**SECTION 02500****PART 1 - GENERAL****1.01 .01 SECTION INCLUDES**

- A. Brick paving set in thickset latex modified portland cement mortar bed on concrete base slab to comply with all requirements of the Downtown Development Districts document CD 143-193, Minimum Sidewalk Requirements within the Downtown Development Districts, requiring samples submitted to the DDD for their approval

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Rod and sealant at expansion joints.

1.03 REFERENCES

- A. ASTM C902 - Pedestrian and Light Traffic Paving Brick.
- B. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.04 SUBMITTALS

- A. Submit samples under provisions of Section 01300.
- B. Submit four samples of brick units to illustrate color, texture and extremes of color range.
- C. Submit product data for all specified products.
- D. Submit a detailed schedule and work plan.
- E. Submit shop drawing illustrating contractors understanding of field pattern and ribbon borders. Submit typical layout of a 20'-0" section of brick paving showing field pattern and ribbon banding. Also submit typical brick patterning surrounding tree planting well, handicap ramps at corners, and at driveways.

1.05 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.

1.07 ENVIRONMENTAL REQUIREMENTS

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

1.08 QUALITY ASSURANCE

- A. Job Mock-Up: Prior to installation of masonry work, install sample mock-up using materials, bond and joint tooling shown or specified for final work. Provide special features as directed for caulking and contiguous work. Build mock-up at the site, where directed, of full thickness and approximately 4' x 4', unless otherwise shown, indicating the proposed range of color, texture and workmanship to be expected in the completed work. 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.

PART 2 - PRODUCTS

2.01 BRICK UNITS

- A. Paving Brick: light traffic paving brick, solid (uncored) brick complying with ASTM C 902, Type I, Class SX, Application PS and as follows:
 - 1. Size: 4" x 8" x 2-1/4" thick modular brick.
 - 2. Average Compression Strength: Not less than 10,400 psi
 - 3. Cold Water absorption: Not more than 7% absorption after 24 hours submersion in cold water.
 - 4. Approved: Equal to Boral Red Brick paver and Boral Savannah Brown pavers at borders Submit samples to Architect for approval.

2.02 PORTLAND CEMENT APPLICATIONS

- A. Portland Cement: ASTM C150, Type I or II.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Liquid Admixture for Setting Bed, Bond Coat and Grout: Acrylic resin or styrene butadiene rubber formulations in factory-prediluted or concentrated form; designed by manufacturer for use with thick-bed mortar, bond coat, and grout applications as follows:
 - 1. Acrylbond TA-865; H.B. Fuller Co.
 - 2. Laticrete 3701 and 226 powder for setting bed and grout, Laticrete 4237 for bond and slurry coat; Laticrete International, Inc.
Hydroment Multi-purpose Acrylic Latex Additive; Upco Division, Emhart Corp

2.03 EXPANSION JOINTS

- E. Refer to reinforced concrete specifications.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION, GENERAL:

- A. All new sidewalks to drain away from existing building structures and properties at a minimum of 1 % slope and maximum of 5% slope. There are some exceptions where curb heights may create drainage towards buildings or adjacent properties. In these instances, Contractor shall contact the Landscape Architect when situations such as these arise for final approval before construction can commence. Maintain existing grades at bottom of curb, building facades and property line side of walks in all instances.
- B. GRADES SHOWN AT BOTTOM OF CURBS ARE ESTIMATES OF EXISTING CONDITIONS BASED ON AVAILABLE SURVEY INFORMATION. CONTRACTOR SHALL CONFIRM ALL GRADES OF STREETS AS BOTTOM OF CURBS, AND ESTABLISH PROPER RELATIONSHIPS TO TOP OF CURBS AS INDICATED. NOTIFY LANDSCAPE ARCHITECT OF ANY DISCREPANCIES IN ELEVATION GREATER THAN 1 INCH.
- C. Cut brick with motor-driven saw equipment 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. Where cutting is required, use the largest size brick units possible and avoid the use of small pieces of brick or large mortar areas.
- D. Set brick in patterns with butt joints.
- E. Install backer rods and sealant at expansion joints as specified in Section 07900.
- F. Tolerances: Maintain surface plane for finished brick floors not exceeding a tolerance of 1/8" in 10' when tested with a 10' straightedge and 1/8" brick to brick.

3.03 PORTLAND CEMENT APPLICATIONS:

- A. Preparation of Subbase: Clean concrete subbase to remove dirt, dust, debris, and loose particles. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water prior to placing setting bed.
- B. Apply slush coat of neat cement grout with latex admixture over surface of concrete subbase about 15 minutes prior to placing setting bed. Limit area of slush coat to avoid drying out prior to placement of setting bed and apply by trowel or brush. Do not exceed 1/16" thickness for cement slush coat.
- C. Setting Bed: Mix one part portland cement to 3 parts sand (measured in a damp, loose condition) Type M mortar, mixed with liquid admixture, to produce a moist surface when

setting bed is ready to receive brick. Spread and screed to a uniform thickness, level in plane or uniformly sloped for drainage as shown. Mix and place only the amount which can be covered with brick prior to initial set. Cut back, bevel edge, remove and discard setting bed material which has reached initial set prior to placing brick.

- D. Place brick before initial set of cement bed occurs. Apply a uniform 1/16" bond coat of cement and liquid admixture and a thin layer of same cement mix to bottom of brick. Tamp and beat brick for complete contact with setting bed. Set and level each brick in a single operation. Set brick in pattern shown, butt jointed as tightly as possible, placing joints not more than 1/8" wide.
- E. Liquid Admixture: Gauge setting bed and bond coat with liquid admixture in strict accordance with admix manufacturer's recommendations.
- F. Tamp and beat pavers with wooden block or rubber mallet to obtain full contact with setting bed and to bring the finished surfaces within indicated tolerances. Set each paver in a single operation prior to initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.
- G. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, strike flush and tool slightly concave, at handicap ramps tool 1/4" deep.
 - 1. Use factory sanded portland cement grout mixed in the proportion one part cement mixed with liquid admixture in strict accordance with admix manufacturer's recommendations.
 - 2. Colored Cement Grout: Factory proportion pigments with other ingredients as selected by the Architect.
- H. REMOVE GROUT SPILLAGE FROM FACE OF BRICK IMMEDIATELY AS WORK PROGRESSES.**
- I. Cure grout as recommended by manufacturer

3.04 REPAIR

- A. Remove and replace unit pavers that are loose, chipped, broken, stained or otherwise damaged or do not match adjacent units as intended. Replace these units to match acceptable pavers.

3.05 CLEANING:

- A. Clean exposed brick masonry surfaces as recommended by BIA Technical Notes 20 "Cleaning Clay Products Masonry".
- B. Clean all exposed surfaces with clean water and stiff brushes until all stains and dirt are removed. The use of commercial cleaning solutions must be in accordance with the manufacturers' recommendations and approved for use on clay pavers.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.06 PROTECTION OF FINISHED WORK

- A. Protect Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Protect finished floors, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

END OF SECTION

WATER DISTRIBUTION

SECTION 02510

1.01 SUMMARY

- A. Scope: The work to be done under this section of the specifications includes all labor, materials, equipment and services necessary to install the water distribution system as indicated on the drawings.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 31 Section “Earthwork” for excavation and backfill required for water system piping and structures.
 - 2. Division 03 Section “Cast-in-Place Concrete” for cast-in-place concrete.
- C. Submittals:
 - 1. General: Submit all product data required by and in conformance with the “Submittals” section of these specifications.
 - a. Submit data on all products and components specified herein.
- D. Quality Assurance:
 - 1. General: Comply with all requirements and standards of the Jefferson Parish Department of Engineering.
 - 2. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to water systems.
- E. Project Conditions:
 - 1. Site Information: Verify existing utility locations. Verify that water system piping may be installed in compliance with design and referenced standards.
 - a. Locate existing water main system piping and structures that are to be maintained.
- F. Sequencing and Scheduling:
 - 1. Coordinate with other utility work.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to Drawings for piping materials.
- B. Concrete and Reinforcement:
 - 1. Concrete: Strength at 28 days as shown on the Drawings.
 - a. Cement: ASTM C 150, Type I or II.
 - b. Fine Aggregate: ASTM C 33, sand.

- c. Coarse Aggregate: ASTM C 33, crushed stone.
 - d. Water: Potable.
- 2. Reinforcement: Steel conforming to the following:
 - a. Fabric: ASTM A 185, welded wire fabric, plain.
 - b. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

2.02 RELATED MATERIALS

- A. Insulated Enclosure: Heated Water Equipment Enclosures for backflow prevention, pump, and sprinkler assemblies: Hot Box, by Hubble Power Systems, or approved equal. Coordinate size of protected enclosure with corresponding exposed utility component.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The installation of the PVC pipe shall conform to the manufacturer's recommendations. The trench bottom shall be relatively smooth and free from roots, rocks, etc. The pipe shall be laid on a smooth bed of river sand six inches in depth for the full width of the trench and extending to the top of the pipe. The sand should be placed and consolidated under the pipe haunches to provide adequate side support to the pipe while avoiding displacement and misalignment. The remainder of the trench should be filled with pumped sand well compacted to the grade as required below.
- B. Offsets in water mains over or under drain lines shall be made by the Contractor with ductile iron fittings or ductile offset fittings. All ductile iron fittings shall be mechanical joint with retainer glands. All ductile iron pipe shall be wrapped with 8 mil. polyethylene wrap. Where off-sets are made over the drain, there shall not be less than 3.5 feet of cover over the offset piping. Before the backfilling of trench, the offsets shall be subjected to an in service visual inspection in the presence of the Architect.

3.02 BACKFILL

- A. Backfill material shall be select fill and shall be placed at or near optimum moisture content and compacted according to Section 312000 – Earthwork.
- B. The above backfill material and compaction procedure shall be applied also for any service connections, offsets, etc.
- C. Backfill and compaction procedures shall comply with all requirements of the local governing agency having jurisdiction and per the Contract Documents.

END OF SECTION

SANITARY SEWERAGE

SECTION 02530

1.01 SUMMARY

- A. Extent of exterior sanitary sewer system as shown on the drawings.
- B. Refer to Division - 31 Section “EARTHWORK” for excavation and backfill required for exterior sanitary sewer system.
- C. Refer to Division 03 Section for concrete work required for sanitary sewer systems.

1.02 QUALITY ASSURANCE

- A. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of sanitary sewer system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary sewer system's materials and products, and the regulations and standards of the Jefferson Parish Department of Engineering.
- C. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to sanitary sewer systems.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for sanitary sewer system materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed sanitary sewer system piping and products, in accordance with requirements of Division 1.

1.03 SYSTEM DESCRIPTION

- A. Sanitary Sewer Gravity Pipeline: Provide mains and laterals of polyvinyl chloride (PVC) plastic pipe.

1.04 DELIVERY AND STORAGE

- A. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
- B. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
- C. Cement, Aggregate, and Reinforcement: As specified in Division 3 section.

- D. Handling: Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

PART 2 – PRODUCTS

2.01 PIPELINE MATERIALS

- A. Refer to Drawings for piping and related materials.

2.02 MISCELLANEOUS MATERIALS

- A. Gaskets and Connectors at Manholes: Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923.

2.03 METAL ITEMS

- A. Frames, Covers and Gratings for Manholes: FSRR-F-621, cast iron.
- B. Manhole Steps: Zinc-coated steel conforming to ANSI A14.3. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

PART 3 – EXECUTION

3.01 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

- A. General Requirements for Installation of Pipeline: Apply except where specific exception is made in the following paragraphs entitled, "Special Requirements."
- B. Location: The work covered by this section shall terminate at a point approximately 5 feet from the building, unless otherwise indicated. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water line.
- C. Earthwork: Perform earthwork operations in accordance with Section 312000, "EARTHWORK" and as indicated on the drawings.
- D. Pipe Laying and Jointing: Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay pipe with the bell ends in the upgrade direction. Adjust spigots in bells and tongues in grooves to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

- E. Connections to Existing Lines: Obtain approval from the local governing utility agency having jurisdiction before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.
- F. Special Requirements:
 - 1. Installation of PVC Plastic Piping: Install pipe and fittings in accordance with paragraph entitled, "General Requirements for Installation of Pipelines" of this section and with the requirements of UNI B5 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of UniBell Plastic Pipe Association (UNI) B5 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
 - 2. Cleanouts: Construct cleanouts of cast iron soil pipe and fittings.
 - 3. Concrete Work: Cast-in-place concrete is included in Division 3 Section.
 - 4. Manhole Construction: Construct base slab of cast-in-place concrete. Make inverts in cast-in-place concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. Construct manholes in accordance with drawings. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe end are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to manholes.

3.02 MISCELLANEOUS CONSTRUCTION AND INSTALLATION

- A. Metal Work
 - 1. Workmanship and Finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises.
 - 2. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

3.03 FIELD QUALITY CONTROL

- A. Field Test and Inspections: The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.
- B. All tests and inspections must meet the requirements of the local governing authority having jurisdiction, and the Contract Documents.
- C. Inspection: Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line.

- D. Leakage Test: Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.
- E. Infiltration Tests and Exfiltration Tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.
- F. Low-Pressure Air Tests: Test in accordance with UNI B6. Allowable pressure drop shall be as given in UNI B6. Make calculations in accordance with the Appendix to UNI B67.
- G. Deflection Testing: Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.
- H. Pull-through Device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:
 - 1. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - 2. Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.
 - 3. Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
 - 4. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
- I. Deflection Measuring Device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
- J. Pull-through Device Procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.
- K. Deflection Measuring Device Procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a

deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

- L. Field Tests for Concrete: Field testing requirements are covered in Division 03 section.

END OF SECTION

STORM DRAINAGE

SECTION 02630

1.01 SUMMARY

- A. Scope: This Section includes storm drainage piping and appurtenances.

1.02 RELATED SECTIONS

- A. The following sections contain requirements that relate to this section:
 - 1. Division 31 Section "Earthwork" for excavation and backfill required for storm drainage system piping and structures.
 - 2. Division 03 Section "Cast-in-Place Concrete".

1.03 SUBMITTALS

- A. General: Submit all product data requested by the Architect in conformance with Section - Submittals.

1.04 QUALITY ASSURANCE

- A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm drainage systems.
- B. Utility Compliance: Comply with all requirements and standards of the Jefferson Parish Department of Engineering specifications.
- C. Contractor shall provide silt fencing, and silt protection, in areas indicated on the Drawings.

1.05 PROJECT CONDITIONS

- A. Site Information: Verify existing utility locations. Verify that storm drainage system piping may be installed in compliance with original design and referenced standards.
 - 1. Locate existing storm drainage system piping and structures that are to be abandoned and closed.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate with other utility work.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE AND FITTINGS

- A. Comply with sizes and specifications as indicated on the drawings.

2.02 DROP INLETS

- A. Refer to drawings.

2.03 CONCRETE AND REINFORCEMENT

- B. Concrete: Portland cement mix, 4,000 psi. at 28 days.
 - 1. Cement: ASTM C 150, Type I or Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed stone or gravel.
 - 4. Water: Potable.
- C. Reinforcement: Steel conforming to the following:
 - 1. Fabric: ASTM A 185, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

PART 3 – EXECUTION

3.01 PREPARATION OF FOUNDATION FOR BURIED STORM DRAINAGE SYSTEMS

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfilled with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of pipe. Fill an initial 6" layer with select fill compacted to 95% of maximum dry density at optimum moisture according to ASTM D-698. Dig bell holes at each pipe joint to relieve the bells of all loads and to warrant continuous bearing of the pipe barrel on the foundation. The remainder of the bedding material shall be placed around and up to the finish grade above the pipe barrel, and compacted to the same density specified before.
- D. Foundation lumber consisting of 100% coverage with the use of 2" x 10" boards shall be used to stabilize the trench before installing the bedding material.

3.02 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground storm drainage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

- D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install piping pitched down in direction of flow, at minimum slope of 1 percent, except where indicated otherwise.
- F. Extend storm drainage system piping to connect to building storm drains, of sizes and in locations indicated.

3.03 DROP INLETS

- A. General: Install drop inlets complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where drop inlets occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.
- B. Construct brick drop inlets as indicated on the drawings.

3.04 CLEANOUTS

- A. Install cleanouts and extension from drain pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.05 FIELD QUALITY CONTROL

- A. Testing: Perform testing of completed piping in accordance with regulations of the local governing utility agency having jurisdiction.
- B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
 - 3. Flush piping between manholes to remove collected debris.
 - 4. Final cleaning of installed storm drainage shall occur no earlier than 30 days prior to final completion.
- C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after pipe between drop inlets and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and reinspect.

END OF SECTION

FLEXIBLE PAVEMENT

02740

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Pavement-marking paint.
- B. Related Sections include the following:
 - 1. Division 2 Section AEarthwork@ for aggregate subbase and base courses and aggregate pavement shoulders.

1.2 STANDARD SPECIFICATIONS

- A. Preparation, equipment, materials, mixing, placing, compacting and testing shall be in accordance with ALouisiana Standard Specifications For Roads and Bridges@ (2006 edition) hereinafter referred to as ALDOTD Specifications A.

1.3 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 1. Firms shall be a registered and approved paving mix manufacturer with the LDOTD.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer=s labels containing brand name and type of material, date of manufacture, and directions for storage.

- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg.F. (15.5 deg. C).
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg. F. (4 deg. C) at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg. F (15.5 deg. C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg. F. (4 deg. C) for oil-based materials, 50 deg. F (10 deg. C) for water-based materials, and not exceeding 95 deg. F (35 deg. C).

PART 2 – PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof; complying with ASTM D 1073.

2.2 ASPHALT MATERIALS

- A. Asphalt Cement: Conform to LDOTD specifications.
- B. Prime Coat: Conform to LDOTD specifications.

2.3 AUXILIARY MATERIALS

- A. Sand: Conform to LDOTD specifications.
- B. Paint: Conform to LDOTD specifications.
 - 1. Color: As indicated.

2.4 MIXES

- A. Hot-mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by LDOTD.

1. Provide Type 3 mix.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with Standard Specifications.

3.2 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide, except where infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base a course for a section before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat.
 2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
 3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).

4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AASHTO's The Asphalt Handbook.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg. F (85 deg C).
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.

- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3 m) straightedge applied transversely or longitudinally to paved areas.

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).

3.8 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to cure for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer=s recommended rates to provide a minimum wet film thickness of 15mils (0.4 mm).

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing laboratory to perform field inspections and tests and to prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing at Contractor=s expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 1. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq.m) or less of installed pavement, but in no case will fewer than 3 cores be taken.

- b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
 - 3. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements of LDOTD Standard Specifications.
- F. Minimum Requirements: Asphalt pavement shall meet or exceed the following requirement:

Marshall Stability (lbs)	<u>BC</u>	<u>WC</u>
Average	1,800	1,500
Individual Test	1,500	1,300
Pavement Density		
Percent of theoretical maximum specific gravity per AASHTO T 209		92.0
	92.0	

- G. Partial payments defined in the LDOTD Standard Specifications shall not be applicable to this work. Work that does not meet the minimum requirements noted above shall be removed.

END OF SECTION 02740

RIGID PAVEMENT

SECTION 02750

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Scope: The work included in this section of the specifications includes all labor, materials, equipment, and services necessary for cement concrete paving as indicated on drawings, including curbs, gutters, walkways, and pavement.
- B. Prepared subbase is specified in "Earthwork" section.
- C. Concrete and related materials are specified in Division 3.

1.03 SUBMITTALS

- A. Provide samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.
- B. Concrete Testing Service: The Owner will employ a testing agency to perform material evaluation tests and to review concrete mix designs for compliance with the Contract Documents.
 - 1. The testing lab shall be in compliance with ASTM E 329 "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing" and ASTM C 1077 "Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation".
 - 2. The testing laboratory shall submit a certificate of accreditation and the scope of accreditation that indicates compliance with the above standards.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 2. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.

- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.
 - 1. Furnish in flat sheets.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.
- D. Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 60 steel bars, unless otherwise indicated.
- E. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- F. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- G. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- H. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.
- I. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type 1-D, Class A unless other type acceptable to Architect. Moisture loss no more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
- J. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
- K. Epoxy Adhesive: ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

2.02 CONCRETE MIX

- A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control and as herein specified.
- B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:
 - 1. Minimum Compressive Strength: 4,000 p.s.i.
 - 2. Slump Limit: 8 inches for concrete containing high-range water-reducing admixture (superplasticizer); 4 inches for other concrete.

2.03 AUXILIARY MATERIALS

- A. Paint: Conform to LaDOTD specifications.
 - 1. Color as indicated.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 FORM CONSTRUCTION

- A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork for grade and alignment to following tolerances:
 - 1. Top of forms not more than 1/8 inch in 10 feet.
 - 2. Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.03 REINFORCEMENT

- A. Locate, place, and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.04 CONCRETE PLACEMENT

- A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.
 - 1. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
 - 2. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
 - 3. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.
 - 5. When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without damage.

- B. Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2- inch overlap to adjacent mats.
- C. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.05 JOINTS

- A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
 - 1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
 - 1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
- C. Construction Joints: Place construction joints at end of placements and at locations where Placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.
 - 1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
 - 2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.
- D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
 - 1. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
 - 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 - 4. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

- E. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.06 CONCRETE FINISHING

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
- C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
- D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as indicated on the drawings as follows:
 - 1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.
 - 2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.07 CURING

- A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.08 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Architect.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

3.09 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement shall include the following, as directed by Architect.
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 2. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 - 5. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- C. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
- D. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, slump, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

BIKE RACKS**SECTION 02871****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Bike Racks.

1.02 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of bicycle racks similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing bicycle racks similar to those required for this project and with a record of successful in-service performance.
- C. Source Limitations: Obtain each color, finish, shape and type of bicycle rack from a single source with resources to provide components of consistent quality in appearance and physical properties.
- D. Product Options: Drawings indicate size, shape and dimensional requirements of bicycle racks and are based on the specific system indicated.

1.03 SUBMITTALS

- A. Product Data: Include physical characteristics such as shape, dimensions, bicycle, material parking capacity and finish for each bicycle rack.
- B. Shop Drawings: Show installation details for each bicycle rack.
- C. Samples for Verification: Submit finish samples for review and verification.
 - 1. Maintenance Data: For each bicycle rack. Include recommended methods for repairing damage to the finish.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Upon delivery, before signing for shipment, inspect for any damages and notate on the B.O.L.
- B. Store bicycle racks in original undamaged packages and containers until ready for installation. Handle bicycle racks with sufficient care to prevent any scratches or damage to the finish.

1.05 WARRANTY

- A. Bicycle racks carry a one year manufacturer's limited warranty against defects in materials and workmanship. The one year warranty period begins the date the product is shipped from the manufacturer

PART 2 - PRODUCTS**2.01 BIKE RACKS**

- A. Basis of Design: bicycle racks manufactured by DERO BIKE RACK CO., 5522 Lakeland Ave. N., Crystal, MN 55429, Phone: 1-888-337-6729, Website: www.dero.com
- B. Materials: 2" x 11g square tube.
- C. Finishes: 304 grade stainless steel finish

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examination of substrates: The Installer must examine the substrate and the conditions under which the work is to be performed, 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. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install the bike rack bolted to the sub-slab below pavers as indicated on the drawings in accordance with manufacturer's printed instructions for the particular conditions of installation in each case.
- B. Install level, plumb, and at proper height. Cooperate with other trades for installation to adjacent finish surfaces. Repair or replace damaged units as directed by Architect.
- C. Secure rigidly in place.

END OF SECTION

EXTERIOR PLANTING

SECTION 02900

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Section includes, but is not limited to, the following:
 - 1. Providing delivery and installation of trees, shrubs, herbaceous plant materials and landscape bed edging in designated planting areas.
 - 2. Protecting existing site features to remain.
 - 3. Clearing and grubbing of existing trees, shrubs and herbaceous plant materials for installation or new plant material.
 - 4. Staking and guying.
 - 5. Mulching.
 - 6. Fertilizing.
 - 7. Warranty.
 - 8. Maintenance.
 - 9. Clean-up

1.2 REFERENCES

- A. ASNS: "American Standard for Nursery Stock," ANSI Z60.1 latest edition, published by the American Association of Nurserymen, (AAN).
- B. SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.
- C. Agricultural chemist: Qualified, experienced public or private soils testing laboratory engaged by the Contractor, capable of providing test results as specified, and approved by the Landscape Architect.
- D. American National Standards for Tree Care Operations, ANSI A300. American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.
- E. Hortus Third, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.
- F. ISA: "International Society of Arboriculture"
- G. AAN: "American Association of Nurseryman"

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- G. Planting Area: Areas to be planted.
- H. Planting Soil: Approved mix containing no less than fifteen (15) percent clay with a PH range from five (5) to seven (7). It should be fertile, friable, natural loam, reasonably free of clay lumps, brush, weeds, and other litter, free of root stumps and stones larger than two (2) inches and any other extraneous or toxic matter harmful to plant growth. It shall be a mixture of the following materials in quantities specified: one part humus, one part coarse building sand, and one part shredded bark mulch.
- I. Herbaceous Plant Material: This term refers to but is not limited to perennials and grasses.
- J. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

- A. Plant material sources: Submit proposed sources for all plant material within 10 working days of award of a contract. Provide name and location of nursery, contact person, and telephone number.
- B. Product Data: For each type of product indicated.
 - 1. Submit technical descriptive data from each manufactured or packaged product of this Section. Include manufacturer's product testing and analysis and installation instructions for manufactured or processed items and materials.
 - 2. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 3. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project

names, addresses, and year completed, and include names and addresses of owners' contact persons. Qualifications must conform as specified herein.

- D. **Product Certificates:** For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 3. Submit certified analysis for each treatment material specified and as used. Include guaranteed analysis and weight for packaged material.
 - 4. Furnish certification that all plant material is true to name and in conformance with the Specifications. In addition, furnish certificates of inspection as may be required by Federal, State, or other authorities that plant material is free of disease or hazardous insects.
 - 5. Furnish certifications / cultivars by supplying nursery.
 - 6. Prior to the use on-site of any insect or disease control materials, submit a list of control materials and quantities intended for use in controlling insects and diseases prevalent and expected on the site. Submittal shall include data demonstrating the compatibility of the control materials and methods of installation or application with the specified planting types and varieties.

- E. **Landscape Maintenance Instructions:** Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

- F. **Notices and Scheduling**
 - 1. Within 14 calendar days after Contract Notice to Proceed, submit invoices or certificates of deposit from nurseries guaranteeing timely delivery of all specified and pre-sourced plant materials. If any plant materials are unavailable at the time of submittal, the Contractor shall contact the Owner's Representative to determine acceptable alternatives. Indicate the following:
 - a. Confirm size and grade of materials to be planted.
 - b. Indicate source of origin and the health of plant materials, each type.

 - 2. Submit a schedule itemizing landscape work to be performed. This schedule shall be in addition to the Project Contract Schedule(s) required by the General Conditions and shall be submitted within 14 calendar days after the Contract Notice to Proceed.
 - a. Include in the schedule, anticipated dates for commencement and sequencing of landscape work, including but not limited to layout and layout approval, placement for each plant type, and commencement of maintenance period. Refer to the specified related requirements, herein.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** A qualified landscape Installer whose work has resulted in successful establishment of plants. Qualifications for Landscape Contractors shall including but not be limited to:

1. Experience: Five (5) years' experience in landscaping, irrigation or arboriculture on similar projects in terms of scope of work and budget to the subject project. The Contractor shall have appropriate experience related to the work specified in the drawings and specifications.
 2. Licensure: For projects in which the Contractor will perform landscape, irrigation or arboreal work, the Contractor shall have a current and valid Landscape Horticulturalist License, Arborist License and/or Irrigation Contractor License issued by the Louisiana State Horticultural Commission as is applicable to the scope of work of the project. Contractor shall provide proof of qualifications.
 - a. If work is performed by a Subcontractor, the Subcontractor shall have a current and valid Landscape Horticulturalist License, Arborist License and/or Irrigation Contractor License issued by the Louisiana State Horticultural Commission as is applicable to the scope of work of the project. Subcontractor shall provide proof of qualifications.
 3. Installer's Field Supervision / Contractor's Foreman: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress. Must have significant and demonstrated experience in the installation of major mixed herbaceous, tree and shrub plantings in the last five (5) years in private and public gardens. This person shall be a Landscape Horticulturalist, Arborist or Irrigation Contractor licensed by the Louisiana Horticultural Commission as is relevant to the scope of work.
- B. Soil Testing Laboratory Qualifications: An independent or university laboratory recognized by the State Department of Agriculture with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Plant Material: Meet or exceed applicable AAN standards.
1. Plant List: Investigate sources of supply prior to submitting bid. Confirm that size, variety and quantity of plant material specified on Plant List can be supplied. Failure to take this precaution will not relieve the successful bidder from his responsibility for

furnishing and installing all plant material in strict accordance with the Contract requirements and without additional expense to the Owner.

- a. Substitutions will not be permitted unless substantiated written proof is supplied that a specified plant is not obtainable. In this situation a proposal to use the nearest equivalent size or variety with an equitable adjustment of Contract Price will be considered.

2. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe plant materials further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected plant materials immediately from Project site.

E. Drawing References and Definitions:

1. Refer to the Drawings for the planting schedule. The planting schedule is a guide only. Quantities, sizes and types of plant material, however, shall be verified by the Contractor's review of the planting plan. Where discrepancies may exist the Contractor shall notify the Landscape Architect immediately.
2. Herbaceous plant materials that are indicated adjacent to the shrub or tree symbol shall not be planted over or in root balls.
3. Botanical names shall take precedence over common names.

F. Material Content and Waste Management: Comply with the following and other specified requirements.

1. All planting materials shall originate from a source within a 500 mile radius of the Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Deliver bulk materials with each individual shipment accompanied by an affidavit from the vendor / supplier, countersigned by the Contractor upon receipt, identifying the material type, composition, analysis, and weight and certifying that the material furnished complies with the Specification requirements of this Project. Affidavits shall be furnished in duplicate with one copy submitted to the Construction Manager. The second copy shall be retained by the Contractor.

C. Plant Material:

1. Notify the Landscape Architect five (5) working days in advance of any delivery of plant materials to the site.
2. Dig and handle plants with care to prevent injury to trunks, branches and roots.
3. Do not prune prior to delivery. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Pack and ship to insure arrival at site in good condition. Provide protective covering during delivery. No plants will be accepted if ball is cracked or broken.
4. Deliver plants after preparations for planting have been completed, and arrange for Plant Inspection by Landscape Architect immediately. Do not proceed with planting until Plant Inspection has been done.
 - a. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade). If planting is delayed more than 24 hours after delivery, set balled and burlapped plants on the ground well protected with soil or other acceptable material. Set plants and trees in their appropriate aspect (sun, filtered sun, or shade). Protect balls and roots and container grown material from freezing, sun, drying winds, and/or mechanical damage. Water as necessary until planted.
 - b. Do not remove container-grown stock from containers before time of planting.
 - c. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.
 - d. Heeling in of plants shall not be allowed for more than three (3) days without approval of the Landscape Architect.
5. Immediately remove rejected or damaged plant material from the site and replace with material selected and approved by the Landscape Architect. Prepare, maintain and submit a list of such items removed to the Owner's Representative.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 1. Notify Owner's Representative no fewer than five (5) working days in advance of proposed interruption of each service or utility.

2. Do not proceed with interruption of services or utilities without Owner's Representative written permission.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.
- F. Should the Contractor, in the course of the Work, find any discrepancies between the Contract Documents and physical conditions or any omissions in the Drawings, or in layout as furnished by the Owner, it will be the Contractor's duty to inform the Owner's Representative immediately in writing for clarification. Work done after such discovery, unless authorized by the Owner's Representative and Landscape Architect, shall be done at the Contractor's risk and such Work shall be corrected as directed at the Contractor's expense.
- G. Existing Conditions
 1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.
 2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be his duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate Work of this Section with Work of all other Sections of Specification.

1.10 PLANT INSPECTION

- A. Inspection of Plant Material at the Project Site:
 1. Notify the Landscape Architect ten (10) working days in advance of any delivery of plant material to the Project site.
 2. The Landscape Architect and Owner's Representative will inspect all plant material upon delivery to the site which shall be prior to installation. Allow time duration on-site, as approved by Landscape Architect, for inspection and layout adjustments prior to installations.
 - a. The Contractor shall arrange for adequate manpower and equipment on-site at the time of plant material inspections and installation to provide a complete

staked layout, as otherwise specified in this Section, and to unload, open, and handle plant material during inspection.

- b. Rejected plants shall be removed immediately from the site.
3. Herbaceous plant materials shall be available for inspection at a single location prior to delivery on-site. Perennials will also be inspected upon delivery to the Project site.
4. Install plants immediately after inspection is completed and plants accepted per installation instructions.

B. Inspection for Substantial Completion

1. The Landscape Architect, with the Contractor and the Owner's Representative, will make an inspection for Substantial Completion of the Work of this Section. The Contractor shall furnish full and complete written program for maintenance of the planting for review by the Landscape Architect and the Owner's Representative at the time of the request for Substantial Completion.
2. Maintain all planting areas until Substantial Completion in accordance with the requirements specified herein.
3. Submit a written request for inspection at ten (10) working days prior to the day on which the inspection is requested.
 - a. All planting shall be alive, healthy and installed as specified to be accepted.
 - b. The Contractor shall prepare a list of items to be completed or corrected for review by the Landscape Architect.
 - c. Upon completion of the inspection, the Landscape Architect shall amend the list of items to be completed or corrected, and indicate the time period for their completion or correction.
 - d. Landscape Architect will make another inspection after notification from the Contractor that all items have been completed and corrected. If the work is complete and acceptable, the Landscape Architect will recommend, in writing to the Owner the Substantial Completion of the Work.
4. The Contractor's responsibility for construction period maintenance will terminate only when the project is complete and handed over to the Owner, not at Substantial Completion.

1.11 REGULATORY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of local, State, and Federal authorities having jurisdiction. Provide labor, materials, equipment, and services necessary to make Work comply with such requirements without any additional cost to the Owner.
- B. Procure and pay for permits and licenses required for Work of this Section.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The following list of materials shall be required under this section to complete all work described in these specifications and/or indicated on the project drawing. This includes, but is not limited to the following items and all related items necessary to complete this project:

1. Plants
2. Planting Soil and Amendments
3. Mulch
4. Root Hormone Stimulant
5. Pre-Emergent Herbicide
6. Slow Release Fertilizer
7. Slow Release Watering Bags – All Trees to have watering bags
8. Stakes
9. Tree Trunk Protectors
10. Edging

- B. Approvals for substitution must be requested no later than three working days prior to bid opening.

2.02 PLANTS

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
2. Substitutions of plant materials will not be permitted unless authorized in writing by the Landscape Architect. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.

- B. Trees and Shrubs

1. Shall be of specimen quality, exceptionally heavy, symmetrical, and so trained or favored in development and appearance as to be unquestionably and outstandingly superior in form, compactness, and symmetry. They shall be sound, healthy, vigorous, well branched, and densely foliated when in leaf; free of disease and insects, eggs, or larvae; and shall have healthy, well-developed root systems. Typical of their species or variety with normal habits of growth, in accordance with ASNS, they shall be free from physical damage or other conditions that would prevent vigorous growth.
 - a. Trees with a natural excurrent growth form will have only one main branch leader. Trees with a damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over three-quarter (3/4) inch in diameter that are not completely closed will be rejected.
 - b. Trees shall have good branch structure in accordance with the natural form for the species. Branching will be plentiful and uniformly spaced along the trunk and have firm, strong attachments with the trunk.
 - c. Sprouts shall be cleanly removed.
 - d. Pruning scars will be clean cut leaving little or no protrusion from the trunk or branch.

- e. V-shaped branch unions with included bark will not be accepted.
- f. Nomenclature: Agree with SPN or as accepted in the nursery trade for varieties not listed therein. Clonal types shall be true.
- g. Poor-quality trees with cracked, wet, or loose root balls, poorly developed trunk-to-crown ratios, or undersized root balls shall be rejected.
- h. Trees that settle out of plumb due to inadequate soil compaction either under or adjacent to the root ball shall be excavated and reset. In no case shall trees that have settled out of plumb be pulled upright using guy wires.

- 2. Conform to measurements specified on Plant List. Dimension plants in their natural position. Plants larger than specified may be used, without increasing Contract Price, if approved by the Landscape Architect, and the root ball shall be increased in proportion to the size of the plant. Large plants cut back to sizes specified will not be accepted.

- a. Measure height or spread and quality in accordance with standards specified in ASNS (unless otherwise specified).

C. Herbaceous Plant Material.

- 1. Furnish in sizes indicated on the Plant List and conform to ASNS standards for species and sizes.
- 2. Provide plants of sizes, grades, and ball or container sizes complying with ASNS for types and form of plants required. Plants of a larger size may be used if acceptable to the Landscape Architect.
- 3. Perennials shall have a minimum of 30% visibility of root stock upon inspection of pot soil media. Actual perennial size shall be commensurate with specified container. Under no circumstances shall undersized material in specified size be accepted.

D. Container Plants

- 1. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the American Standard for Nursery Stock and be free of circling roots on the exterior and interior of the root ball.
- 2. No trees will have large roots growing out of the container.
- 3. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.
- 4. The rooting medium shall be weed-free.

E. Balled and Burlapped (B&B) Plant Materials

- 1. Trees designated B&B shall be properly dug with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the American Standard for Nursery Stock. Balls shall be firmly wrapped with nonsynthetic burlap and secured with nails and heavy, nonsynthetic twine. The root collar shall be apparent at surface of ball. Trees with loose, broken, processed, or manufactured root balls will not be accepted, except with special written approval before planting.

- F. Labeling: Label at least one plant of each variety, and size with a securely attached, waterproof tag bearing legible designation of common name and full scientific name,

including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

2.03 PLANTING SOIL AND AMENDMENTS

- A. Planting Soil Mixture: Garden soil is to be an approved mix containing no less than fifteen (15) percent clay with a PH range from five (5) to seven (7). It should be fertile, friable, natural loam, reasonably free of clay lumps, brush, weeds, and other litter, free of root stumps and stones larger than two (2) inches and any other extraneous or toxic matter harmful to plant growth. It shall be a mixture of the following materials in quantities specified: one part humus, one part coarse building sand, one part sand, and one part shredded bark mulch.
- B. Batture sand is prohibited due to associated weed infestation issues.
- C. Amendments: Should the Contractor deem a necessity for soil amendment materials, including but not limited to organic material such as compost; or any fertilizers the Contractor shall submit the recommendation in writing to the Landscape Architect and Owner's Representative prior to use of such materials. Application of such materials is prohibited without written consent from the Owner's Representative.
 - 1. Compost: Shall be double grind #2 screened composted hardwood garden mulch.
 - 2. Peat Humus: Is decomposed peat with no identifiable fibers and with a PH range suitable for intended use.

2.04 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Aged Ground Pine Bark for mulching
 - 2. Pine Needles for top dressing

2.05 PLANT TREATMENT MATERIALS

- A. Herbicides, Fungicides, Pesticides: Approved before use for type and rate of application by Landscape Architect and local, state and/or federal agencies with jurisdiction. Organic treatment methods should be utilized before employing chemical treatments.
 - 1. Pre-Emergent Herbicide: Shall be Pendimethalin, Oryzalin or approved equal applied as per the manufacturer's instructions at the time of planting.
 - 2. Root Hormone Stimulant: Mycor Tree Saver, or approved equal.
- B. Anti-desiccant: "Wiltproof" as manufactured by Wiltproof Products, Inc., P.O. Box 4280, Greenwich, Ct. 06830, 203-531-4740.

2.06 COMMERCIAL FERTILIZER

- A. All fertilizer shall be a commercial balanced formula with the least 25% organic materials, and shall conform to applicable State fertilizer laws. It shall be a slow release formula, "Osmocote," or equal, and shall be used as specified by manufacturer. Fertilizer, unless

otherwise specified, shall be delivered mixed as specified, in standard size, unopened containers, showing weight, analysis, and name of manufacturer. Fertilizer shall be complete and of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For trees and shrubs, Osomocote 18-6-12 to nine (9) months formulation (Sierra Chemical Corporation), or an approved equal.

2.07 MISCELLANEOUS PRODUCTS

- A. Water: Potable, clean fresh and free from harmful materials. Water if not available at the time of planting shall be furnished by the Contractor. Make every effort to coordinate planting with availability of water. All hoses and other equipment shall be furnished by the Contractor as needed.
 1. If the Project irrigation system is unavailable in whole or in part the Contractor shall use additional hand watering methods to supplement irrigation as needed.
- B. Burlap: Non-synthetic, biodegradable. Synthetic or plasticized material shall not be used.
- C. Slow Release Watering Bags: All trees shall receive a slow release watering bag and shall be twenty (20) gallon slow release by Treegator or equivalent manufacturer. The tree watering bag must meet or exceed the following specifications:
 1. Made of polyethylene reinforced with nylon webbing and treated with U.V. inhibitors.
 2. All sides are watertight with ¼" heat seals.
 3. Bag is secured to the tree with heavy duty nylon zippers.
 4. Drip holes are cored through both ply of material to allow for adjustable drip times.
 5. Treegator is manufactured by:
Spectrum Products, Inc.
1-866-873-3428
www.treegator.com
- D. Tree Staking: All Trees must be stakes as per these regulations.
 1. Stakes: Green T bar fence posts, 6' minimum length.
 2. Ties shall be ArborTie, or approved equivalent, tree staking and guying material in color green. Approvals for substitution must be requested no later than three working days prior to bid opening.
 3. Material for ties shall be: flat woven, polypropylene material, ¾" wide and 900 lb. break strength.
 4. Arbor Tie is manufactured by:
Deep Root Partners, L.P.
81 Langton Street
San Francisco, CA 94103
1 (800) 458-7668
www.deeproot.com
- E. Tree Trunk Protectors: Made of expandable polyethylene to form a barrier around the tree to protect against bark damage from gardening equipment, tools and other small pests. Tree shield allows water and light to reach the plant while offering plenty of air circulation to prevent moisture and mildew build-up. This tube color is gray.

- F. Edging: To be used around all new planting beds.
 - A. Heavy Duty Straight Profile Edging: Permaloc CleanLine or approved equal, 1/8" (3.2mm) x 4" (102mm) high, extruded aluminum, 6063 alloy, T-6 hardness, landscape edging for straight-line and curvilinear applications in corrugated straight profile, as manufactured by Permaloc Corporation, Holland MI 49424, telephone (800) 356-9660. Section shall have loops on side of section to receive stakes spaced approximately 2 to 3 feet (610 mm to 915 mm) apart along its length.
 - B. Thickness: 1/8 inch (3.2 mm) gage section at 0.072 inch (1.83 mm) minimum thick with 0.135 inch (3.4 mm) exposed top lip and 3/16 inch (4.8 mm) gage section at 0.116 inch (2.95 mm) minimum thick with 0.187 inch (4.75 mm) exposed top lip.
 - C. Length: 8' (2.44m) sections.
 - D. Connection Method: Section ends shall splice together with an interlocking stakeless snap-down design.
 - E. Stake: 12" (305mm) Permaloc extruded aluminum stake. Stakes to interlock into section loops.
 - F. Finish: Green DuraFlex Painted. Paint finish shall comply with AAMA 2603 for electrostatically baked on paint.

PART 3 - EXECUTION

3.1 GENERAL

- A. All locations for plants shall be flagged by the landscape contractor prior to excavation. Flag locations shall be approved by Landscape Architect prior to excavation.
- B. Prior to construction of planting areas or excavation for plants verify and ascertain the location of all irrigation lines, electric cables, conduits, drainage systems and other utilities. Take proper precautions so as not to disturb or damage sub-surface elements. If sub-surface elements necessitate the need to relocate planting materials the Contractor shall notify the Landscape Architect promptly to determine the appropriate action plan. Should the Contractor fail to notify the Landscape Architect or take the aforementioned precautions the Contractor shall be responsible for making requisite repairs at the Contractor's expense.
- C. Insofar as is practical, plant materials shall be planted on the day of delivery. In the event this is not possible, the Contractor shall protect that stock not planted from sun or drying winds and shall keep the plants well watered and stored in the shade. Plants shall not remain unplanted for longer than three days after delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. All plants shall be lifted and handled from the bottom of the ball only. Plants moved with a ball will not be accepted if the ball is cracked or broken before or during planting operations.
- D. The Contractor shall be responsible for providing all necessary equipment, materials, and labor to complete the project.
- E. Plant list quantities are provided as an aid to bidders only. The Contractor shall verify all quantities on the plan. Improper plant counts made by the Contractor shall be no cause for additional costs to the Owner.
- F. Edging to be installed where planting areas abut sodded areas to create a clear separation. Edging is not necessary when planting abuts a concrete walk.

3.2 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not work soil in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.3 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
 - 1. Protect existing site improvements to remain from damage during construction.
- B. Restore damaged improvements to their original condition, as acceptable to Owner.
- C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.4 LAYOUT

- A. Stake out locations for new plants and outlines of planting areas for approval by the Landscape Architect where shown on Drawings except where obstructions exist below ground, overhead, or where changes have been made during construction. Adjustments shall be approved by the Landscape Architect. Completely layout planting beds and pits before seeking approval by the Landscape Architect.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, perennials, ornamental grasses, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner as directed by a Licensed Arborist where such roots and branches obstruct installation of new construction.
 - 3. Use only hand methods or air spade for grubbing within tree protection zone.

- B. Re-grade as necessary to smooth and fill depressions caused by clearing and grubbing operations. The Contractor shall preserve existing soils to the greatest extent possible during clearing and grubbing operations.
 - 1. Maintain all “flat” areas and slopes to allow free flow of surface drainage without ponding.
- C. Make every effort to protect existing utilities, including but not limited to the irrigation system. Should damage to the irrigation system occur during clearing and grubbing operations the Contractor shall be responsible to sufficiently repair the damage as determined by the Owner.

3.6 PLANTING BED ESTABLISHMENT

- A. Rake surface clear of stones, debris, rubbish, and trash before pit excavation. Dispose of such material away from the site.
- B. Planting soil shall be installed as plant bed material for all shrubs and groundcovers in accordance with the details and plans.
- C. The contractor shall provide positive drainage for all beds and plant areas.
- D. Obstructions: If rock, underground construction work, utilities, tree roots, or other obstructions are encountered in the excavation of planting areas, alternate locations for any planting shall be determined by the Landscape Architect.

3.7 PLANT MATERIAL INSTALLATION

- A. Excavation: All plant pits or trenches shall be excavated in accordance with the Planting Details after approval of staked locations by the Landscape Architect. Excavation of plant pits shall be done after soil testing, and analysis and approval by the Landscape Architect
 - 1. When compacted soil is encountered, sides and bottoms shall be loosened by scarifying.
 - 2. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.
 - a. Tree pits are to be excavated to the depth and widths indicated on the drawings. If the planting area under any tree is initially dug too deep, the soil added to bring it up to the correct level should be thoroughly tamped.
 - b. Excavate to the extent possible without disturbing roots of existing adjacent trees.
 - c. Excavate using hand methods under drip line of adjacent trees.
 - d. In areas of slowly draining soils, the root ball may be set up to three (3) inches or one eighth (1/8) of the depth of the root ball above the adjacent soil level.
 - e. Save the existing soil to be used as backfill around the tree.
 - 3. Exercise extreme caution during excavation to avoid damaging or interrupting existing underground utilities. Use appropriate detection equipment to locate utilities during excavation of pits to the required depth.

4. Erect barricades, warning signs, or other protective devices as is required by local, state or federal laws and regulations to protect open excavation.
5. Excavated material shall be removed and disposed off-site, unless approval, in writing, has been obtained from the Landscape Architect.
6. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees are encountered in excavations.

B. Drainage of Plant Beds and Tree Pits

1. Verify by testing that beds and pits are free draining. If beds and pits are not free draining notify Landscape Architect and Owner and submit alternative method of drainage for approval.
 - a. Do not put plants in beds and pits until the beds and pits have been approved by the Landscape Architect.
2. Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree pits and plant beds.

C. Obstructions Below Ground

1. In the event that rock, underground construction work, utilities or obstructions are encountered in any plant pit excavation work under this Contract, alternate locations may be selected by the Landscape Architect.
2. Where locations cannot be changed, the obstruction shall be removed, subject to the Landscape Architect's approval, to a depth of not less than three (3) feet below grade and no less than six (6) inches below bottom of ball or roots when plant is properly set at the required grade. Payment shall be made in accordance with the Contract.

D. Placement of Plants

1. Plants shall be set in center of pits plumb and straight, in accordance with the planting details, and faced to give best appearance and relationship to adjacent plants and structures.
2. Do not plant until plant material has been approved by the Landscape Architect at site.
3. Plant to such depth that the finished grade level of the plant, after settlement, will be the same as that at which the plant was grown, and so that the root flare is at finish grade.
4. Do not pull burlap out from under balls. Remove platforms, wire and surplus binding from top and sides of ball. Cleanly cut off all broken or frayed roots.
5. Remove plants from containers by cutting or inverting the container.
6. Set the bare root plants in the pit so that all roots, when fully extended will not touch the walls of the planting pit and the uppermost roots are just below the original grade.
7. Place planting soil mix around tree root balls in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

E. Backfilling

1. Compact planting mixture around bases of balls to fill all voids. Remove all burlap and ropes from the tops of balls. Remove all non-biodegradable materials from the plant pit. Clip and fold down wire baskets.
2. Planting mixture shall be backfilled in layers of not more than six (6) inches and each layer thoroughly compacted and free of voids before next layer is put in place.
3. Spread out the roots of bare root plants properly and work backfill mix among them. Prune off broken roots in a natural position. Water thoroughly while backfilling.
4. Work the backfill soil around and beneath the ball leaving no air pockets. Continue adding and tamping soil until the hole is half full. Add water to partially fill the hole. Let the water soak into the soil and finish backfilling.

F. Installation Inspection

1. The Landscape Architect will inspect trees for injury to trunks, evidence of insect infestation and improper pruning. Treat injuries of infestation by accepted methods. Remove and replace plants determined by the Landscape Architect to have injuries or infestations which cannot be treated or which have caused unacceptable damage to the plant.
2. Trees shall stand plumb.

G. Mulching

1. Mulch backfilled surfaces of planting areas and other areas indicated.
2. Apply three (3) inches average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within six (6) inches of trunks or stems. Mulch within two (2) days of planting.
3. Mulch layer shall include basic organic mulch in (2) inch layer, with top dressing mulch in (1) inch layer.

H. Staking and Guying

1. Staking of trees shall be done immediately after planting. Trees shall stand plumb after staking.
2. Staking methods shall be approved by the Landscape Architect. Stakes shall be of sufficient strength to maintain the tree in an upright position that overcomes the particular circumstances that initiated the need for staking.
3. Where ArborTie, or approved equivalent, is used, it shall be installed as per the manufacturer's instructions.
4. Stakes shall be removed by the contractor at the end of the first growing season. Any tree that is not stable at the end of this time shall be rejected.
5. Three stakes shall be used for each tree
6. Stakes shall not penetrate the ball of earth moved with the tree. Stakes shall penetrate existing soil below tree pit.
7. It shall be the landscape contractor's responsibility to prevent plants from falling or being blown over and to straighten or replant all plants which are damaged due to a lack of staking. If unstaked, plants blown over by high winds shall not be a cause of additional expense to the owner, but shall be the financial responsibility of the landscape contractor.

I. Pruning and Repair

1. Plants shall not be heavily pruned at the time of planting. Healthy lower branches and interior small twigs should not be removed except as necessary to clear walks and roads. In no case should more than one-quarter of the branching structure be removed.
2. Pruning is required at planting time to correct defects in the tree structure, including removal of injured branches, double leaders, waterspouts, suckers, and interfering branches.
3. Each tree shall be pruned to preserve natural character of plant.
4. All injured tree and shrub roots shall be pruned to make clean cut ends before planting.
5. Main leaders of trees shall not be cut back.
6. If required, cut branches and roots with clean, sharp pruning instruments; do not break or chop. All cuts shall be clean and smooth, with the bark intact with no rough edges or tears.
7. No heavily pruned material will be accepted at any time. If the natural form is destroyed, the plant will be rejected.
8. Trees that have had roots pruned must be treated with a root stimulating hormone.
9. The trees or roots shall be pruned in accordance with generally accepted arboricultural practices.
10. The Contractor shall notify the Department of Parks and Parkways Urban Forester's office whenever trees or roots need to be pruned prior to beginning construction. All pruning is to be done under the supervision of the Department of Parks and Parkways Urban Forester.
11. Excavation of roots that need to be pruned must be done by hand or air spade within the drip line of the tree.

J. Edging

1. All edging locations shall be laid out in the field with spray paint by the Contractor and approved by the Landscape Architect prior to installation of any edging. Field mark locations for steel landscape edging as indicated on Contract Drawings.
 - a. Horizontal Alignment: Install straight sections true to the alignments as indicated, free of waves or bends, using strings as guides.
2. Anchor with steel stakes spaced approximately 30 inches on-center, driven below top elevation of edging, or at every stake pocket location in landscape edging sections designed and manufactured to receive stakes. Stakes shall be located in solid undisturbed soil.
 - a. Vertical Alignment: Install parallel with the finished grade.
 - b. Damaged Edging: Replace edging sections damaged by construction operations.
3. In the event that a tree root of one inch diameter or greater conflicts with the installation of the edging, contact the Landscape Architect for further instruction.

K. Watering

1. Upon completion of planting operation, water plant material thoroughly or over the entire planting bed. Continue to water for the duration of the project until handed over to the Owner.
2. Outfit each tree with a twenty (20) gallon slow release watering bag.
3. Apply water slowly so as to penetrate the entire root system and at a rate which will prevent saturation of the soil.

3.8 MAINTENANCE PRIOR TO FINAL ACCEPTANCE

- A. Maintenance shall begin immediately after each plant is planted. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected until the project is handed over to the Owner at Final Acceptance, not at Substantial Completion.
- B. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.
- C. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed.
- D. Upon completion of planting, and prior to Substantial Completion, remove from site excess soil and debris and repair all damage resulting from planting operations.
- E. As part of maintenance, provide protection and extermination measures against gophers, rabbits, or other rodents, and repair damage caused by their activities. The Contractor shall notify the Owner's Representative of any insect or disease promptly in writing prior to any applications of control materials such as fungicides, insecticides or the like.
- F. Replace mulch materials damaged or lost in areas of subsidence.
- G. Irrigate as required. Utilize watering trucks if necessary.
- H. Do no pruning without approval of the Landscape Architect.
- I. In anticipation of a freeze, contractor shall protect newly planted material to the best of their ability to avoid damage from a freeze.

3.9 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- D. Leave site in a neat, orderly, "broom clean" condition at the end of each work day.

3.10 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.11 FINAL ACCEPTANCE OF WORK

- A. Final Acceptance shall be the final review and completion of all punch list items. The Guarantee Period shall be one full year after the date of Final Acceptance.
- B. Inspection of the work to determine its completion (Final Acceptance) will be made by the Landscape Architect upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to anticipated date. After the inspection, the Contractor will be notified of the date that the work has been approved or of any deficiencies of the requirements for work to remedy deficiencies.

3.12 WARRANTY PERIOD AFTER FINAL ACCEPTANCE OF WORK

- A. Warranty Periods from Date of Substantial Completion:
 - 1. Trees: Twelve (12) months.
 - 2. Shrubs: Twelve (12) months.
 - 3. Ground Covers, Biennials, Perennials, and Other Plants: Twelve (12) months.

3.13 MAINTENANCE AFTER FINAL ACCEPTANCE

- A. Contractors to provide one year of maintenance after final acceptance of work, including pruning, trimming, watering, fertilizing, top dressing of mulch, and weeding.

END OF SECTION

CAST-IN-PLACE CONCRETE**SECTION 03300****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Scope: The work to be done under this section of the specifications includes all labor, materials, equipment, and services necessary for cast-in-place concrete including formwork, reinforcing, mix design, placement procedures, finishes, as indicated on drawings and herein specified.
- B. Work includes use of fiber reinforcement at exposed concrete walls and slabs at the following: Refer to Drawings and specifications herein.

1.03 CAST-IN-PLACE CONCRETE: Includes the following:

- A. Foundations and footings.
- B. Slabs-on-grade.
- C. Columns, Girders, Beams and Elevated Slabs.
- D. Foundation walls.
- E. Equipment pads and bases.
 - 1. Include all concrete pads and supports for mechanical and electrical equipment where indicated. Unless otherwise shown, these pads shall include concrete of the size required to support the equipment purchased and 500 lbs. of reinforcing steel per cubic yard of concrete.

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315R "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures. Reproductions made from contract documents will not be

allowed. Submit one (1) electronic print for review and comment. The Engineer will have up to ten (10) working days from the time of receipt of the submittal to complete his review and return the submittal to the Architect. Review of shop drawings by the Architect/Engineer will be for general compliance with contract documents. No responsibility will be assumed for correctness of dimensions, and quantities.

- D. Samples of materials as requested by Architect, including names, sources, and descriptions.
- E. Laboratory test reports for concrete materials and mix design test.
- F. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete."
 - 2. ACI 318, "Building Code Requirements for Structural Concrete," current edition.
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice," current edition.
- B. Concrete Testing Service: The Owner will employ a testing agency to perform material evaluation tests and to review concrete mix designs for compliance with the Contract Documents.
 - 1. The testing lab shall be in compliance with ASTM E 329 "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing" and ASTM C 1077 "Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation".
 - 2. The testing laboratory shall submit a certificate of accreditation and the scope of accreditation that indicates compliance with the above standards.
- C. Materials and installed work may require testing and retesting at any time during progress of Work. Retesting of rejected materials for installed Work shall be done at Contractor's expense.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60.
- B. Steel Wire: ASTM A1064, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 1064, welded steel wire fabric. Flat sheets only. Rolls are not permitted.
- D. Deformed-Steel Welded Wire Fabric: ASTM A1064.
- E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1).
- F. Fiber Reinforcement for additional temperature and shrinkage crack protection at exposed structural walls and slabs: 1.5lbs of Fibermesh 150 per cubic yard of concrete by Sika or approved equal. Refer to Manufacturer's written instructions for application to mixes.

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
 - 1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.
- B. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 - 2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- C. Lightweight Aggregates: ASTM C 330.
- D. Water: Potable.

- E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A.
- H. High-Range Water-Reducing Admixture: ASTM C 494, Type approved by Architect.
- I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type C or E.
- J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

2.04 RELATED MATERIALS

- A. Vapor Barrier: Vapor barrier shall have all of the following qualities:
 - 1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 15 mils minimum
 - 3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
 - 4. Warranty: (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.
 - 5. Basis of design product shall be “Stego Wrap Vapor Barrier (15-mil)” by Stego Industries LLC. Other approved products include “Vaporguard” by Reef Industries, “PMPC” by WR Meadows.
 - 6. The following accessory products shall be by the approved vapor barrier product manufacturer and as required per manufacturer instructions to achieve the vapor barrier system warranty. Accessory products by manufacturers other than the approved vapor barrier manufacturer are not allowed:
 - a. Seam tape
 - b. Penetration mastic and tape
 - c. Perimeter/terminated edge seal tape and bar
 - d. Penetration prevention products
 - e. Vapor barrier-safe screed system
- B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.

3. Polyethylene-coated burlap.
- D. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meters when applied at 200 sq. ft./gal.
 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g per liter.
- E. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
- F. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- G. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1 inch thick to feathered edges.
- H. Bonding Agent: Polyvinyl acetate or acrylic base.
- I. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
- J. Waterstops: Volclay RX-101RH by CETCO or approved equal.

2.05 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs. The independent testing agency shall review and approve the proposed mix design.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been submitted to Architect.
- C. Design mixes to provide normal weight concrete or light weight concrete with the 28-day compressive strength as indicated on drawings.
- D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 1. Not more than 4 inches.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

2.06 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 40 deg F (10 deg C) and falling.
- C. Waterproofing Admixture: Xypex Admix C-500 or Xypex Admix C-1000 as determined by curing conditions on the day of concrete placement, or an approved equal from an alternate product manufacturer. Refer to manufacturer's written instructions and specifications for admixing and placement procedures. Waterproofing admixture shall be added to concrete batches scheduled for placement at the elevator pit. Refer to drawings for locations.

2.07 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes. Ice can be added to concrete so that delivery time can remain at 1-1/2 hours.

PART 3 EXECUTION

3.01 GENERAL

- A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.02 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 117 and ACI 347 limits:
 - 1. Provide Class A tolerances for concrete surfaces exposed to view.
 - 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

- D. Formwork for Grade Beams and Pile Caps: Provide vertical formwork at the perimeter of grade beams and pile caps. Contractor shall install formwork as described here-in to ensure plumbness of cast vertical surfaces.
- E. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 VAPOR RETARDER/BARRIER INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 - 2. Vapor barrier shall be neatly placed. Follow the profile of the bottom of the slab and beams and be in intimate contact with the fill. Stop at impediments such as piles, dowels, and waterstops.
 - 3. If arranging placement of vapor barrier perimeter/edge seals prior to placement of concrete, seal vapor barrier to scheduled wet-cast slab perimeter/edge using Manufacturer's recommended adhesive product designed for this use, and remove dirt, debris, and mud from this adhesive product prior to concrete placement.
 - 4. Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
 - 5. Overlap joints 6 inches and seal with manufacturer's tape.
 - 6. Apply tape to a clean and dry vapor barrier.
 - 7. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 8. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 9. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.
 - 10. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the slab itself using Stego Crete Claw Tape, per manufacturer's instructions.
 - 11. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.

3.04 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
 - 1. Install only flat sheets. Rolls are not permitted.
- F. Where not specifically detailed on the drawings, support slab top reinforcing bars with continuous #4 reinforcing bars. Slab top reinforcing bars less than 6 feet in length shall have two support bars and slab top reinforcing bars greater than 6 feet in length shall have support bars spaced at no more than 3'-0" o.c. These bars shall be equally spaced along the length of the slab top reinforcing bars.

3.05 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. Provide keyways as indicated on drawings or at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Provide waterstops at all construction joints in areas indicated on the drawings.
- D. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- E. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

- F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

- 1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.06 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.07 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
 - 1. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 2. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.08 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
 - 1. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the

machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
 - 1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 - 3. Maintain reinforcing in proper position on chairs during concrete placement.
 - 4. Floor Slab Tolerance: Floor finish tolerances of floor slabs shall conform to the requirements of the specified finish floor manufacturers, and in accordance with ACI 117 and ASTM E 1155 Standard Method for Determining Floor Flatness and Levelness using the F-Number System. Specified Overall Finish floor tolerances shall meet the requirements of “flat” as described in ACI 117, unless a more stringent tolerance is required by a finish floor installation. Specified overall and minimum (SOF_L and MLF_L) levelness tolerances shall apply only to level slabs-on-ground, or to level suspended slabs that are shored when tested. Refer to flooring specifications for additional concrete substrate flatness and levelness requirements.
- E. Cold-Weather Placement: Comply with provisions of ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- F. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305.1 and as specified.
 - 1. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.09 CONCRETE FLOOR FINISH MEASUREMENT AND TOLERANCES

- A. Testing Procedure: ASTM E 1155.
- B. Tolerance on Floor Elevations: Construction tolerance on absolute floor elevation from the specified elevation as shown on the drawings shall be as specified below, taken from ACI 117:
 - 1. Slab-on-Grade Construction: $\pm 3/4"$.
 - 2. Top Surfaces of Formed Slabs Measured Prior to Removal of Supporting Shores: $\pm 3/4"$.
 - 3. Top Surfaces of All Other Slabs: $\pm 3/4"$.
- C. Random Traffic Floor Finish Tolerances:

1. Specified overall values for flatness (SOF_F) and levelness (SOF_L) shall conform to the values listed below for the floor surface classification noted for each slab category noted.
 - a. Conventional:
 - 1) SOF_F : 20.
 - 2) SOF_L : 15.
 - b. Moderately Flat:
 - 1) SOF_F : 25.
 - 2) SOF_L : 20.
 - c. Flat:
 - 1) SOF_F : 35.
 - 2) SOF_L : 25.
 - d. Very Flat:
 - 1) SOF_F : 45.
 - 2) SOF_L : 35.
 2. Minimum local values for flatness (MLF_F) and levelness (MLF_L) shall equal $3/5$ of the SOF_F and SOF_L values, respectively, unless noted otherwise. The MLF_F and MLF_L values shall apply to the minimum areas bounded by the column lines and half-column lines, or the minimum areas bounded by the construction and contraction joints, whichever are the smaller areas.
 3. The SOF_L and MFL_L tolerance values shall apply only to level slabs-on-ground or to level, uncambered suspended slabs that are shored such that it cannot deflect from the time the floor is placed to the time it is measured.
 4. Slabs specified to slope shall have a tolerance from the specified slope of $3/8"$ in 10 feet at any point.
- G. Construction Requirements to Achieve Specified Floor Finish Tolerances:
1. Forms shall be properly leveled, in good condition, and securely anchored including special attention to ends and transitions.
 2. Bearing surfaces for straightedges such as form edges or previously poured slabs shall be kept clean of laitance, sand, gravel, or other foreign elements.
 3. Screeds shall be maintained in good condition with true round rolling wheels and level cutting edges. The use of optical sighting equipment such as lasers is recommended for checking levelness and straightness. The Contractor shall promptly adjust or replace equipment when test results indicate substandard work.
 4. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations. If mineral, non-oxidizing metallic, or metallic floor hardeners are used, the slab shall be wood bullfloated immediately after the straightedge.
- D. Contractor Responsibility for Concrete Floor Finish Requirements: Floor finish requirements shown below (flatness and levelness tolerances) are minimum requirements that apply unless stricter requirements are contained in instructions for installation of applied

floor products in which case the Contractor is responsible for attaining the values prescribed by the manufacturer of such products.

E. Concrete Floor Finish Tolerance for Slab-on-Grade Construction:

1. Concrete Placement: Concrete shall be placed and screeded to predetermined marks set to elevations prescribed on the drawings.
2. Finish Tolerances of Random Traffic Floor Surfaces:
 - a. Slabs in nonpublic areas, mechanical rooms, surfaces to received raised computer flooring, surfaces to have thick-set tile or a topping, and parking structures: Conventional.
 - b. Carpeted Areas: Moderately Flat.
 - c. Exposed Slabs in Public Spaces, Slabs to Receive Thin-Set Flooring: Flat.

F. Concrete Floor Finish Tolerance for Shored, Cast-in-Place Suspended Slab Construction:

1. Concrete Placement: Formwork shall be set and securely braced so that soffits are positioned to allow scheduled concrete member sizes and thicknesses within tolerances specified in ACI 117. Concrete shall be placed and screeded to predetermined marks on the form surface conforming to elevations prescribed on the drawings.
2. Camber: Formwork camber, as indicated on the drawings, shall be set to provide a uniform, smooth soffit profile in each direction. Minimum slab thickness, as specified on the drawings, shall be maintained throughout the slab surface to a tolerance as specified in ACI 117. Tolerance on camber shall be $\pm 1/4"$. Levelness F-Number tolerances specified below do not apply to areas of the floor where camber or intentional slope is shown.
3. Finish Tolerances of Random Traffic Floor Surfaces:
 - a. Slabs in Nonpublic Areas, Mechanical Rooms, Surfaces to Received Raised Computer Flooring, Surfaces to Have Thick-Set Tile or a Topping, and Parking Structures: Conventional.
 - b. Carpeted Areas: Moderately Flat.
 - c. Exposed Slabs in Public Spaces, Slabs to Receive Thin-Set Flooring: Flat.
 - d. Movie or Television studios: Super Flat.
4. Extra Concrete: The contractor shall include in his bid any additional concrete required to achieve the specified slab surface finish tolerance.
5. Concrete Placement at Column Bays Supported by Unshored Transfer Girders: Concrete in floor areas supported by unshored transfer girders shall be placed and screeded to predetermined marks placed over the slab conforming to elevations as specified on the drawings. At least the minimum slab thickness, as specified on the drawings, shall be maintained throughout the slab surface. The Contractor shall conform to the F_F values specified above.

G. Concrete Floor Finish Tolerance – Unshored Steel Deck on Shored or Unshored Steel Beam or Steel Joist Floor Construction:

1. Concrete Placement: Concrete over steel deck shall be placed and screeded level and flat to the tolerance specified below, maintaining at least the minimum slab thickness at all locations as specified on the drawings. The Contractor shall increase the slab thickness as required to compensate for steel deck deflection, and in unshored beam construction, residual beam camber and beam deflection in order to achieve a level and flat floor within specified tolerances.
2. Finish Tolerance of Random Traffic Floor Surfaces:
 - a. Slabs in Nonpublic Areas, Mechanical Rooms, Surfaces to Receive Raised Computer Flooring, Surfaces to Have Thick-Set Tile or a Topping, and Parking Structures: Conventional.
 - b. Carpeted Areas: Moderately Flat.
 - c. Exposed slabs in public spaces, slabs to receive thin-set flooring: Flat.
 - d. Eighty percent (80%) of the final floor surface shall fall within an envelope of 0.75" centered about the mean elevation of all the readings. The mean elevation of all readings shall not deviate from the specified design grade by more than ± 0.375 ".
3. Extra Concrete: The Contractor shall include in his bid any additional concrete required to achieve the specified slab surface finish tolerance and to compensate for steel deck deflection, beam camber and beam deflection.
4. Concrete Placement at Column Bays Supported on Transfer Girders or Trusses: Concrete in floor areas supported by transfer girders or trusses shall be placed and screeded to predetermined marks placed over the steel deck slab conforming to elevations as specified on the drawings. At least the minimum slab thickness, as specified on the drawings, shall be maintained throughout the slab surface. The Contractor shall conform to the F_F values specified above.

H. Remedial Measures for Slab Finish Construction Not Meeting Specified Tolerances:

1. Application of Remedial Measures. Remedial measures specified herein are required whenever either or both of the following occur:
 - a. The composite overall values of F_F or F_L of the entire floor installation measure less than specified values.
 - b. Any individual test section measures less than the specified absolute minimum F_F or F_L value.
2. Modification of Existing Surface:
 - a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work can be repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately undertake the approved repair method.
 - b. The Contractor shall submit for review and approval a detailed work plan of the proposed repair showing areas to be repaired, method of repair, and time to affect the repair.

- c. Repair method(s), at the sole discretion of the Architect/Engineer or Owner's Representative, may include grinding (floor stoning), planing, retopping with self- leveling underlayment compound or repair topping, or any combination of the above.
 - d. The Architect/Engineer or Owner's Representative maintains the right to require a test repair section using the approved method of repair for review and approval to demonstrate a satisfactory end product. If, in the opinion of the Architect/Engineer or Owner's Representative, the repair is not satisfactory an alternate method of repair shall be submitted or the defective area shall be replaced.
 - e. The judgment of the Architect/Engineer or Owner's Representative on the appropriateness of a repair method and its ability to achieve the desired end product shall be final.
 - f. All repair work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.
3. Removal and Replacement:
- a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work cannot be satisfactorily repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately commence to remove and replace the defective work.
 - b. Replacement section boundaries shall be made to coincide with the test section boundaries as previously defined.
 - c. Sections requiring replacement shall be removed by sawcutting along the section boundary lines to provide a neat clean joint between new replacement floor and existing floor.
 - d. The new section shall be reinforced the same as the removed section and doweled into the existing floor as required by the Engineer. No existing removed reinforcing steel may be used. All reinforcing steel shall be new steel.
 - e. Replacement sections may be retested for compliance at the discretion of the Architect/Engineer or Owner's Representative.
 - f. The judgment of the Architect/Engineer or Owner's Representative on the need for replacement shall be final.
 - g. All replacement work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces to be exposed to view, covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

Repair and patch defective areas with fins and other projections. These projections shall be completely removed and smoothed. Repair all other surface defects in accordance with Concrete Surface Repairs, as specified herein.

- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.

3.11 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 - 1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.13 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive old or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- B. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
 - 1. Provide moisture curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Use continuous water-fog spray.
 - c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
 - 2. Provide moisture-retaining cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and Curb as follows:
 - a. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

- b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
 - 1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.14 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Comply with ACI 301-10, Chapter 2, Article 2.3.3 – Reshoring and Backshoring.

3.15 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable.

3.16 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.
- B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids, and holes left by tie rods and bolts down to Solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and

- brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement shall include the following, as directed by Architect.
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 7. Field testing the concrete density by ASTM C138.
- C. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
- D. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, slump, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

CONCRETE FLOORS - SEALED**SECTION 03350****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Where indicated "Sealed" floor, provide herein specified clear epoxy slip resistant sealer on exposed concrete floors. See drawings for locations of SC-1 and SC-2 sealers
- B. Comply with requirements of Division 3 Section - Concrete Work.

C. SUBMITTALS

- a. Product Data: Comply with Section 01300.
- b. Manufacturers Application Instructions: Submit descriptive data and specific recommendations for mixing, application and curing including any precautions of special handling instructions required. Submit certification of the installer as specified

1.03 QUALITY ASSURANCE

- A. Materials used in the floor surfacing shall be the products of a single manufacturer.
- B. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials.
- C. Mock-up: Prior to starting application of sealer, provide full scale mock-up to establish acceptable quality, durability, and appearance. Mock-up area must not be less than 100 square feet.
 - 1. Acceptable mock-up to be standard of quality for remaining work.
 - 2. Accepted work may remain in place. Unacceptable work to be removed and replaced until acceptable

PART 2 - PRODUCTS**2.01 CONCRETE**

- A. For concrete materials see Division 3 Section - Concrete Work.

2.02 EPOXY SEALER

- A. Sealer: Two component epoxy sealer, 100% solids by volume, self-leveling, to provide a high strength, dustproofing, water resistant sealed surface recommended for high traffic use. Primer shall be low-viscosity high build 100% solid epoxy primer to penetrate the concrete substrate.
 - 1. Equal to Armoseal .
 - 2. Color: Clear, gloss finish
 - 3. Reduction of water absorption into concrete: 91%.

PART 3 - EXECUTION**3.01 APPLICATION OF SEALER**

- A. Remove surface elements including curing compound, oil, grease, etc by scrubbing with an industrial grade detergent or a degreasing compound to neutralize substrate and mechanical blast to etch the surface in strict accordance with sealer manufacturers printed instructions. Remove any weak, contaminated or deteriorated concrete by shotblasting or other suitable mechanical means. Follow mechanical cleaning with vacuum cleaning. Check for removal of acid with moist pH paper. Reading shall be greater than 10
- B. **SC-1 Sealer:** Apply the following self-priming coats of millage recommended by the manufacturer.
 - 1. One Coat ArmorSeal 8100 reduced 1pint per gallon with water; 2-4 dry mil thickness
 - 2. One coat ArmorSeal 8100 Gloss without reduction; 2-4 dry mil thickness
 - 3. Coefficient of Friction: 0.6 - 0.8 (dry or wet)
- C. **SC-2 Sealer:** Apply primer and finish coats of millage recommended by the manufacturer, but not less than total 10-15 dry mils.
 - 1. One Coat ArmorSeal 33 Epoxy Sealer/Primer –
 - 2. One coat ArmorSeal 650 SL/RC (low VOC) Gloss Finish
 - 3. Coefficient of Friction: 0.6 - 0.8 (dry or wet)

END OF SECTION

MORTAR**SECTION 04100****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Mortar for masonry. Colored mortar at all exterior exposed masonry. Three (3) different grout colors.
- B. Grout for reinforced masonry, bond beams, lintels, etc.

1.02 RELATED SECTIONS

- A. Section 04200 - Unit Masonry: Installation of mortar and grout.
- B. Section 08112 - Steel Frames: Grouting steel door frames.

1.03 REFERENCES

- A. ASTM C5 - Quicklime for Structural Purposes.
- B. ASTM C144 - Aggregate for Masonry Mortar.
- C. ASTM C150 - Portland Cement.
- D. ASTM C207 - Hydrated Lime for Masonry Purposes.
- E. ASTM C270 - Mortar for Unit Masonry.
- F. ASTM C404 - Aggregates for Masonry Grout.
- G. ASTM C476 - Grout for Masonry.
- H. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- I. ASTM C1019 - Method of Sampling and Testing Grout.
- J. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Include design mix, indicate method used, required environmental conditions, and admixture limitations.

- C. Mix Design: Independent testing laboratory, hired by the Contractor shall provide mix design. Mix design shall include certified test results that portland cement will be “low alkali” as specified herein.
- D. Certificates: Submit certificates attesting to compliance with applicable specifications for grades, types, classes, etc. reports on mortar indicating conformance to ASTM C270.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store protect and handle products to site under provisions of Section 01600.
- B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I, except Type III may be used in cold weather.
 - 1. Provide white cement if required to produce required mortar color.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Quicklime: ASTM C5, non-hydraulic type.
- E. Water: Clean and potable.
- F. Grout Aggregate: ASTM C404.

2.02. MORTAR MIXES

- A. Mortar: ASTM C270, Type S utilizing the Proportion Method to achieve 1800 psi strength
 - 1. No chlorides or masonry cements permitted.
 - 2. Limit cementitious materials in mortar to portland cement-lime.
 - 3. Approved: Cement/Lime Mortamix® by Holcim, Inc. or Argus USA
- B. Colored Mortar: Produce mortar, ASTM C270 Type S utilizing the Proportion Method to achieve 1800 psi strength of color required by use of colored aggregates in combination with selected cementitious materials.

1. Mix to color selected by the Architect and approved in the job mock-up.
2. Approved: Rainbow Series colors by Holcim, Inc. or Blue Circle Magnolia Colors.

2.02 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270 and written instructions of the manufacturer of prepackaged cement/lime mix.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. If water is lost by evaporation, re-temper only within two hours of mixing.
- D. Use mortar within two hours after mixing at temperatures of 80 degrees F, or two-and-one-half hours at temperatures under 50 degrees F.

2.03 MORTAR MIX TESTS

- A. Test mortar in accordance with Sections 01410 and 04200.
- B. Testing of Mortar Mix: In accordance with ASTM C780 for compressive strength, consistency, mortar aggregate ratio, and water content and slump.

2.04 GROUT MIXES

- A. Bond Beams and Lintels: 4000 psi strength at 28 days; 7-8 inches slump; mixed in accordance with ASTM C476 Course grout.

2.05 GROUT MIXING

- A. Thoroughly mix ingredients in quantities needed for immediate use in accordance with ASTM C476 and of consistency (fine or coarse) at time of placement which will completely fill all spaces to receive grout.
 1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
 2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.
- B. Add admixtures in accordance with manufacturer's instructions. Provide uniformity of mix.
- C. Do not use anti-freeze compounds to lower the freezing point of grout.

2.06 GROUT MIX TESTS

- A. Test grout in accordance with Section 01410.
- B. Testing of Grout Mix: In accordance with ASTM C1019.
- C. Test mortar mix for compressive strength and slump.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install mortar in accordance with ASTM C780 and to the requirements of the specific masonry section.
- B. Brace masonry for wet grout pressure.
- C. Work grout into masonry cores and cavities to eliminate voids.
- D. Do not displace reinforcement while placing grout.
- E. Remove grout spaces of excess mortar.

END OF SECTION

UNIT MASONRY**SECTION 04200****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Concrete masonry units.
- B. Face Brick. Three (3) colors as specified **Note: Factory notch brick at relief angles as indicated on the drawings.**
- C. Reinforcement, anchorage including L-shape veneer anchor with bottom leg matching the depth of the cavity board insulation, through-wall flashing and accessories. Cavity drainage mesh in cavity and weep holes.
Note: Brick veneer anchors must be installed before application of cavity insulation installation

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 05500 - Metal Fabrications: Placement of loose steel lintels.

1.04 RELATED SECTIONS

- A. Section 04100 - Mortar: Mortar and grouts.
- B. Section 07900 - Joint Sealers: Rod and sealant at control and expansion joints.

1.05 REFERENCES

- A. ANSI/ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- C. ANSI/ASTM C216 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
- D. ASTM C62 - Building Brick (Solid Masonry Units Made From Clay or Shale).
- E. ASTM C90 - Hollow - Load Bearing Concrete Masonry Units.
- F. ASTM C145 - Solid Load Bearing Concrete Masonry Units.
- G. ASTM C129 - Non-Load Bearing Concrete Masonry Units.
- H. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.06 SUBMITTALS

- A. Submit product data provisions of Section 01300.
- B. Submit product data for each type of masonry unit and fabricated wire reinforcement, and ties.

- C. Submit drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 1. Provide setting drawings, templates and directions for the installation of dove tail slots and other anchorages installed as a unit of work under other sections.
 - 2. Shop drawings for stone trim in form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim unit required.
 - 3. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
- D. Submit samples under provisions of Section 01300.
- E. Submit four (4) samples of face brick units and cast stone to illustrate color, texture and extremes of color range.
 - 1. Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning is indicated.
- F. Quality Control Submittals
 - 1. Mix Designs: Submit mix design for each mortar and grout mix, for indicated strength.
 - 2. Field Test Reports: Submit certification that materials conform to requirements of Contract Documents.
 - 3. Certificates: Submit copies for each type of product indicated, submit manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- G. Submit material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
 - 1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
 - 2. Each material and grade indicated for reinforcing bars.
 - 3. Each type and size of joint reinforcement.
 - 4. Each type and size of anchors, ties, and metal accessories.
- H. Submit material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
 - 1. Mortar complying with property requirements of ASTM C270.
 - 2. Grout mixes. Include description of type and proportions of grout ingredients.
 - 3. Masonry units complying with specified tests.
- I. Submit cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

- J. Submit hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

1.07 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products to site under provisions of Section 01600.
- B. Deliver masonry materials to project in undamaged condition.
- C. Store and handle masonry units off the ground, 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 place until units are in an air-dried condition.
- D. Store cementitious materials off the ground, under cover and in a dry location.
- E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- F. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.09 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover top of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry
 - 1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread 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.

- D. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
 - 1. Do not lay masonry units that are wet or frozen.
 - 2. Remove masonry damaged by freezing conditions.
- E. Hot-Weather Construction: Comply with referenced unit masonry standard.

1.10 SEQUENCING AND SCHEDULING

- A. Coordinate the masonry work with installation of window anchors and other embedded items.

1.11 QUALITY ASSURANCE

- A. Fire-Rated Masonry: Wherever a fire-resistance classification is shown or scheduled for unit masonry construction (4-hour, 3-hour, and similar designations), comply with the requirements for materials and installation established by the American Insurance Association and other governing authorities for the construction shown.
- B. Single Source Responsibility: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces. Also obtain all mortar materials from a single source.
- C. Job Mock-Up: Prior to installation of masonry work, erect sample wall panel mock-up using materials, bond and joint tooling shown or specified for final work. Provide special features as directed for caulking and contiguous work. Build mock-up at the site, where directed, of full thickness indicating the proposed range of color, texture and workmanship to be expected in the completed work. 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. Provide mock-up panel for face brick construction.
 - 1. Size: 8' x 8' of wall area selected by the Architect **to include all three (3) specified bricks and choice of 2 different grout colors at each brick colors.**
 - 2. 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. Provide mock-up panel for face brick construction.
- D. Construct masonry in strict accordance with ACI 531.1, "Specification for Concrete Masonry Construction" unless otherwise indicated.

PART 2 - PRODUCTS

2.01 BRICK UNITS

- A. Face Brick: ANSI/ASTM C216, Type FBX, Grade SW.
 - 1. Size: Modular (3-5/8" thick by 2-1/4" high by 7-5/8" long.)

- 2.. Approved: BR-1: French Gray by Cloud Ceramics - BR-2: Charcoal Gray Velour by Glen Gery - BR-3: Black Diamond by Cloud Ceramics

Note: any proposed substitutions must match the texture and color as determined by the Architect and requires prior approval during bidding

- B. Special Bricks: For sills, caps, and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfrosted units with similar texture on all exposed sides.
- C. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.

2.02 CONCRETE MASONRY UNITS

- A. Hollow and Solid Block Units: ASTM C90 Load Bearing, Grade N, Type I - Moisture Controlled; lightweight classification except as follows:
1. Unit Compression Strength: Provide units with minimum average net-area compressive strength of 1,900 psi.
 2. Portland cement shall be low alkali, for general use
 3. Hydrated lime shall be special hydrated lime for masonry purposes
 2. Provide normal weight (125 psf minimum) as indicated on the Drawings at sound rated partitions.
- B. Masonry Units Size: Nominal modular size with face dimension of 8 x 16 inches and 6x16 and 4x16 solid units where indicated. Provide special units for 90° corners, bond beams and lintels.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Adjustable Masonry Veneer Anchors (General): Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it.
1. Structural Performance Characteristics at Metal Studs: Capable of withstanding a 200 lbf load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.
- B. Screw-Attached Masonry Veneer Anchors (Studs) with board insulation in cavity. Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs and bottom leg extended to accommodate the indicated cavity board insulation thickness, and as follows. Units consisting of a metal anchor section and a connector section designed to engage a tie embedded in the veneer mortar joint, complying with the following requirements, spaced 16" x 16":

1. HB-213-2X is a High-Strength Veneer Anchor System combining the HB-213 and the 2xHook with 3/16" round wire tie for bonding with mortar, 3/8 inch joint:
 - a. The L-shaped plate section shall have numerous ribs for added strength and 9/32" holes for connecting screws. Install with 2 screws per anchor
 - b. Backplate Thickness: 12 ga.
 - c. 3/16" round wire tie of length required to engage masonry veneer for full embedment.
 - d. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.
 - e. All components shall be hot-dip galvanized.
 2. Structural Performance Characteristics: Capable of withstanding a 200-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch. at maximum allowed offset (ACI 530 6.2.2.5.5.4) of 1¼".
 3. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange by not less than three exposed threads
Note: minimum two (2) per anchor.
- C. Single Wythe Joint Reinforcement: Ladder type; hot dip galvanized after fabrication, cold-drawn steel conforming to ANSI/ASTM A82, 3/16 inch side rods with No. 9 cross ties not more than 16" o.c. All wire devices shall have tensile strength of 80 ksi and yield strength of 70 ksi
- D. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet bars.
- F. Strap Anchors: Bent steel shape, 1-1/4" wide, not less than 16 gage thick, galvanized to ASTM A123 G90 finish.
- G. Wall Tie at Concrete: Screw applied in pre-drilled hole in concrete with adjustable 3/16" stainless steel triangular wire tie; all components hot-dip galvanized after fabrication; sized to extend within 1" of masonry face; equal to Pos-i-Tie. All wire devices shall have tensile strength of 80 ksi and yield strength of 70 ksi
- H. Flexible Metal Anchors: Where masonry is shown or specified to be anchored to structural framework, provide 2-piece anchors which will permit horizontal and vertical movement of masonry but will provide lateral restraint. All wire devices shall have tensile strength of 80 ksi and yield strength of 70 ksi
1. For anchorage to steel framework, provide 2-piece anchor with 16 gauge galvanized channel slot or 3/8" bar stock flanges for welding to steel and vee-shaped 3/16" wire tie section sized to extend 2" into bed joints of masonry veneer.
 2. For anchorage to concrete or precast concrete framework, provide manufacturer's standard anchors with dovetail anchor section and triangular-shaped wire tie section sized to extend within 1" of masonry face.
- I. All components of anchors and ties shall be hot dip galvanized steel.

- K. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
1. Dur-O-Wall, Inc.
 2. Heckman Building Products, Inc.
 3. Hohmann & Barnard, Inc.

2.04 THROUGH-WALL FLASHING

- A. Stainless steel/ Fabric Flashing: .003 inch thick Type 304 stainless steel sheet factory bonded to a layer of high tensile strength, puncture resistant polymeric fabric for self-adhering membrane with release liner, equal to "Mighty-Flash-SA" by Hohmann & Barnard, Inc..
- B. Primer For Flashing: Type recommended by flashing manufacturer for application and substrates indicated

2.05 ACCESSORIES

- A. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 50%, of width and thickness indicated.
- B. Premolded Control Joint Strips: Material as follows, designed to fit standard sash block and to maintain lateral stability in concrete masonry wall; size and configuration as indicated.
1. Styrene-butadiene rubber compound complying with ASTM D 2000, Designation 2AA-805.
- C. Compressible Filler and Gaskets: Provide compressible filler complying with ASTM D1056, Type 2 (closed cell), Class A, Grade 1, compressible up to 35 percent.
1. Manufacturer: Equal to Williams Everlastic #1056 Joint Filler.
 2. Use for control joints in brick at underside of relieving angles.
 3. Size filler for 1/2" joints, 25% compression unless otherwise shown. Provide 2-1/2" width unless otherwise shown.
- D. Weep Holes: Full head joints.
- E. Cleaning Solutions: Non-acidic, not harmful to masonry work or adjacent materials. Special care shall be taken to keep white concrete masonry units from turning a color as a result of washing solutions applied to adjacent brick surfaces; products shall be equal to products manufactured by ProSoCo, Inc.
- F. Cavity Drainage Material: reticulated, non-absorbent mesh, made from polyethylene strands and shaped (dovetail shape) to maintain drainage at cavity and weep holes without being clogged with mortar droppings equal to "Mortar Net" by Hohman & Barnard/Mortar Net USA. Provide thickness to fill the cavity

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
 - 1. Use dry cutting saws to cut concrete masonry units.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Lay brick units in bond indicated. Course three brick units and three mortar joints to equal 8 inches. Form concave mortar joints.
- D. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form concave mortar joints in all joints except provide cut joints flush in concrete masonry back-up on the cavity side to provide a even surface for application of cavity insulation.

3.04 PLACING AND BONDING

- A. Blending of Face Brick: After bricks are delivered to designated areas, the band on each of four cubes should be broken and the brick from all four cubes shall be used at the same time.
- B. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which insure each clay masonry unit being nearly saturated but surface dry when laid.
- C. Do not wet concrete masonry units.

- D. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- E. Lay hollow masonry units with face shell bedding on head and bed joints.
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- F. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- G. Remove excess mortar as Work progresses.
- H. Interlock intersections and external corners except on stack bond.
- I. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- J. Perform jobsite cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- K. Isolate top joint of masonry partitions from horizontal structural shelf angles compressible joint filler, backing rod and caulking.
- L. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or structure above and install pressure-relieving joint filler in joint between top of partition and underside of strut above.
- M. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- N. Built-In Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
 - 1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 2. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.05 WEEPS AND VENTS

- A. Install weep holes in veneer at maximum 24 inches on center horizontally above through-wall flashing and at bottom of walls.

3.06 CAVITY WALL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.

1. Note: Mortar spread as a bed joint shall be beveled or sloped away from the cavity space to eliminate mortar droppings in the cavity. Weep holes and cavity must be kept free of debris and mortar to allow moisture to exit the wall system.
- B. Build inner wythe ahead of outer wythe to receive cavity insulation.
- C. Place drainage mesh in the bottom of the cavity and all locations that have through wall flashing. Also, place mesh in weep holes

3.07 REINFORCEMENT AND ANCHORAGES - GENERAL

- A. General: Provide anchor devices of type indicated.
- B. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 1. Provide an open space approximately 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and caulk with approved butyl sealant and backer rod per Section 079000.
 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure or embedded in structure.
 3. Space anchors as indicated, but not more than 16" o.c. vertically and 16" o.c. horizontally.
- C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures and other special conditions.

3.08 REINFORCEMENT AND ANCHORAGES - SINGLE WYTHER MASONRY

- A. Install horizontal joint reinforcement 16 inches o.c.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.

3.9 ANCHORING SINGLE-WYTHER MASONRY VENEER

- A. Anchor single-wyther masonry veneer substrate studs with masonry flexible two piece veneer anchors.
- B. Fasten each anchor section through sheathing to metal studs with 2 hot dip galvanized metal fasteners of type recommended by the anchor manufacturer.
- C. Embed tie section in masonry joints. Provide not less than 2 inch air space between back of masonry veneer wyther and face of sheathing.

- D. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
- E. Space anchors as indicated but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 8 inches.

3.1 REINFORCEMENT AND ANCHORAGES - REINFORCED UNIT MASONRY

- A. Install horizontal joint reinforcement 16 inches o.c.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- F. Embed anchors embedded in concrete. Embed anchorages in every second block joint.
- G. Reinforce joint corners and intersections with strap anchors 16 inches oc.

3.12 MASONRY FLASHINGS

- A. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Install flashing manufacturer's recommended primer. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar.
- B. Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing in a bed of mastic and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and cut off flush with face of brick after completion of work.
- C. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", at inner wythe and seal termination. At heads and sills turn up ends not less than 4" to form a continuous pan. Where inner wythe is interrupted by structural column, attach flashing to column face with mastic, cap with stainless steel termination bar and seal with sealant.
- D. Lap end joints minimum 6 inches and roll for good seal and no fishmouths.

- E. Install flashing manufacturer's recommended primer

.

3.13 LINTELS

- A. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed in place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
 - 1. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.
 - 2. Design masonry lintels in accordance with ACI530/ASCE 5/TMS 402.
- B. Install loose steel and poured U-block lintels over openings as indicated on Drawings.
- C. Do not place mortar within $\frac{1}{2}$ inch of either side of steel lintels to allow for expansion.
- D. Allow masonry lintels to attain specified strength before removing temporary supports.
- E. Maintain minimum 8 inch bearing on each side of opening.
- F. Openings Up To 42 Inches Wide): Place two, No. 3 reinforcing bars 1 inch from bottom web.
- G. Openings From 42 Inches Up To 78 Inches Wide: Place two, No. 5 reinforcing bars 1 inch from bottom web.
- H. Openings Over 78 Inches: Reinforce openings as detailed on Drawings.
- I. Use single piece reinforcing bars only.
- J. Support and secure reinforcing bars from displacement. Maintain position within $\frac{1}{2}$ inch of dimensioned position.
- K. Place and consolidate grout fill without displacing reinforcing.

3.14 GROUTED COMPONENTS

- A. Reinforce bond beam with 2, bars, placed as scheduled.
- B. Reinforce pilaster as scheduled.
- C. Lap splices minimum 24 bar diameters.
- D. Support and secure reinforcing bars from displacement. Maintain position within $\frac{1}{2}$ inch of dimensioned position.
- E. Place and consolidate grout fill without displacing reinforcing.

- F. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.15 EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Install preformed control joint filler in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joint in accordance with Section 07900 for sealant performance.
- D. Form expansion joints as detailed.
- E. Joint Spacing: If location of joints is not shown, place vertical joints spaced not to exceed 30'-0" o.c. Locate joints at point of natural weakness in the masonry work.
- F. Build in horizontal pressure-relieving joints where indicated; construct joints by inserting nonmetallic 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Section 07900.
 - 1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer.

3.16 BUILT-IN WORK

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

3.17 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation From Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation From Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
- F. Maximum Variation From Cross Sectional Thickness of Walls: 1/4 inch.

3.18 CUTTING AND FITTING

- A. Obtain Architect approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.19 CLEANING

- A. Clean exposed brick masonry surfaces as recommended by BIA Technical Notes 20 "Cleaning Clay Products Masonry". 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
- B. Remove excess mortar and mortar smears.
- D. Replace defective mortar. Match adjacent work.
- F. Clean soiled surfaces with cleaning solution.
- G. Use non-metallic tools in cleaning operations.

3.20 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Section 01500.
- B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

STRUCTURAL STEEL**SECTION 05120****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Scope: This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
- B. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" current edition, and as otherwise shown on drawings.
- C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts (each type), including nuts and washers.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.
- C. Shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
 - 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
 - 3. See Section Submittals for shop drawings requirements. Reproductions made from contract drawings will not be accepted. Submit one (1) electronic print for review and comment. The Engineer will have up to ten (10) working days from the time of receipt of the submittal to complete his review and return the submittal to the Architect. Review of shop drawings by the Architect/Engineer will be for general compliance with contract documents. No responsibility will be assumed for correctness of dimensions, quantities or details.
 - 4. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
 - 5. All shop drawings used in the field must bear the Architect/Engineer shop drawings review stamp with "No Exceptions Taken" indicated.

6. For connections not scheduled or detailed include stamped calculations and shop drawings prepared under supervision of a Louisiana-licensed Structural Engineer.
- D. Mill Test Reports: Submit manufacturer's certified test reports to the testing laboratory and architect showing chemical analysis and results of tensile and bending tests. Tests shall meet the requirements of ASTM A6/A6M.
- E. Test reports conducted on shop and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.
- F. AISC certification documentation for fabricators and erectors.

1.04 QUALITY ASSURANCE

- A. Standard Specifications: Except as modified or supplemented by these specifications, materials, design, fabrication, and erection of Structural Steel shall be in accordance with the American Institute of Steel Construction's "Specifications for Structural Steel for Buildings, Allowable Stress Design and Plastic Design", June 22, 2010, and the A.I.S.C. "Code of Standard Practice for Steel Buildings and Bridges", April 14, 2010. A.I.S.C. Steel Construction Manual, Fourteenth Edition.
- B. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
 1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."
 - a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:
"This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."
 2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
 3. "Specifications for Structural Joints using ASTM F 3125 Bolts" approved by the Research Council on Structural Connections.
 4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
 5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- C. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 2. If recertification of welders is required, retesting will be Contractor's responsibility.
- D. Fabricators and Erectors shall be AISC certified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off-ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Structural Steel.
 - 1. Shapes, except for channels, angles and plate: ASTM A992 Grade 50.
 - 2. Channels, angles and plate: ASTM A 36.
- C. Cold-Formed Steel Tubing: ASTM A 500, Grade B, min. fy = 46 ksi.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501, min. fy = 35 ksi.
- E. Anchor Bolts: ASTM F 1554, non-headed type unless otherwise indicated.
- F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
 - 1. Provide hexagonal heads and nuts for all connections.
- G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows.
 - 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM F 3125.
 - 2. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.
- H. Electrodes for Welding: Comply with AWS Code.
 - 1. Welding electrodes for manual shielded metal-arc welding shall conform to AWS A5.1 or A5.5 E70XXX welding electrodes and flux used in submerged arc process shall conform to AWS A5.17 F7X-EXXX. Use low hydrogen electrodes for A572 steel.
- I. Headed Concrete Anchors (H.C.A.): To meet or exceed AWS specification D1.1.
- J. Deformed Bar Anchor (D.B.A.): Manufacture red in accordance with ASTM A 496.

- K. Structural Steel Primer Paint: Rust-inhibitive conforming to Fed. Spec. SSPC 15 and be compatible with finish paint systems.
- L. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 2.0 parts sand, by volume, with minimum water required for placement and hydration.
- M. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
 - 1. Bolt field connections, except where welded connections or other connections are indicated.
- C. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- D. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.
 - 1. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
 - 2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

- A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
 - 2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
 - 3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

- B. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.04 GALVANIZING

- A. Items shown on the plans to be galvanized and bolts for same shall be hot dip zinc coated after fabrications. Galvanizing shall be done in accordance with A.S.T.M. Serial Designation A123 and A153. Any zinc coating that is damaged shall be touched up with Galvacon as manufactured by Southern Coatings in accordance with the manufacturer's recommendations.

2.05 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 1. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 - 1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 – EXECUTION

3.01 ERECTION

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary Members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
- C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.
- D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure within specified AISC tolerances.
 2. Splice members only where indicated and accepted on shop drawings.
- E. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- F. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- G. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.02 QUALITY CONTROL

- A. The Owner will engage an independent testing and inspection agency to inspect high-strength bolted welded connections and to perform tests and prepare test reports.
1. The testing lab shall be in compliance with ASTM A 880 "Practice for Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys".
 - a. The testing laboratory shall submit a certificate of accreditation, including the scope of accreditation that indicates compliance with the above standards.
 - b. Visual inspection of welds shall be performed by an AWS Certified Welding Inspector (AWS-QC-1).
 - c. The inspection of welds shall be overseen by an AWS Certified Welding Inspector.
 2. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
 3. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
 4. Testing agency may inspect structural steel at plant before shipment.

- B. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- C. Shop-Bolted Connections: Inspect or test in accordance with AISC specifications. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, Table 2.
- D. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Perform tests on 20% of all full-pen welds as follows: Ultrasonic Inspection: ASTM E 164.
- D. Field-Bolted Connections: Inspect in accordance with AISC specifications.
- F. Field Welding: Inspect and test during erection of structural steel as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Perform tests of all (100%) full-pen welds as follows: Ultrasonic Inspection: ASTM E 164.
- G. Testing and Inspection of Headed Concrete Anchors (H.C.A.): The testing lab shall conduct tests and inspections in accordance with AWS D1.1, latest edition, Chapter 7 “Stud Welding”.

END OF SECTION

STEEL JOISTS**SECTION 05210****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes: All steel joist work as shown on the drawings.

1.03 QUALITY ASSURANCE

- B. Standard Specifications: Except as modified or supplemented herein, materials, designs, fabrication, painting and erection of all steel joists and bridging for same shall be in accordance with the latest edition of the following publications of the Steel Joist Institute, as applicable:
 - 1. Standard Specifications for Open Web Steel Joists, K-Series, latest edition.
 - 2. Standard Specifications for Long Span Steel LH-Series and Deep Long Span Steel Joists, DLH-Series, latest edition.
 - 3. Standard Specifications for Joist Girders, latest edition.
 - 4. Code of Standard Practice for Steel Joists and Girders, latest edition.
- C. Welders: All welders for field welds shall be approved by an independent Testing Laboratory in accordance with American Welding Society standards and qualified for the type of welding which they will perform.

1.04 SUBMITTALS

- A. Manufacturer's Data: For information only, submit 2 copies of manufacturer's specifications and installation instructions for each type of joist, joist girder and its accessories. Include manufacturer's certification that joists comply with "Standard Specifications".
- B. Shop Drawings: Submit detailed drawings showing layout and erection of joists, special connections, jointing and accessories. Include the mark, number, size and properties, panel point locations, type, locations and spacing of joists and bridging. See Section - Submittals for shop drawing requirements. Reproductions made from contract drawings will not be acceptable. Submit one (1) electronic print for review and comment. Refer to Division 1 requirements. The Engineer will have up to ten (10) working days from the time of receipt of the submittal to complete his review and return the submittal to the Architect.
- D. Design Computations: Furnish design computations bearing the seal and signature of a Civil Engineer with State of Louisiana registration. Refer to Division 1 requirements.

PART 2 - PRODUCTS**2.01 MANUFACTURE**

- A. See Article "Standard Specifications" preceding. Manufacturer of steel joists must be a member of the Steel Joist Institute or must be approved by the Architect prior to receipt of bids.

2.02 MATERIALS

A. GENERAL

- 1. Comply with "Standard Specifications".
- 2. Joist and bridging design must meet the uplift requirements required by the drawings.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with "Standard Specifications".

3.02 FIELD CONNECTIONS

- A. All field connections of steel to steel, including bridging, shall be welded.
- B. The Owner's independent Testing Laboratory shall visually inspect all connections in field to determine quality, size, and compliance with reviewed erection drawings. Where the quality of a weld is in question, the Architect will be advised. The Contractor may then be required to remove and reweld the connection or if the Contractor desires he may have the weld inspected further by radiography. The cost of this radiography inspection will be borne by the Contractor whether or not the weld is acceptable.

3.03 FIELD PAINTING

- A. After erection, all field connections, welds, and abraded places shall be touched up with same paints as shop coat. Refer to Section - Painting, for additional field coats of paint.

END OF SECTION

STEEL DECKING**SECTION 05300****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SECTION INCLUDES

- A. All steel decking as shown on the drawings.
- B. Standing Seam Metal Roofing, if required by the drawings, is specified in Division 7.

1.03 QUALITY ASSURANCE

- A. Standard Specifications: Except as modified or supplemented herein, the decking shall be designed in accordance with the latest edition of AISI "Specifications for the Design of Cold-Formed Steel Structural Members and all applicable requirements contained in "Design Manual for Composite Decks, Form Decks and Roof Decks" of the Steel Deck Institute, Inc.
- B. Testing – Owner's independent testing laboratory will witness all welded connections.

1.04 SUBMITTALS

- A. Manufacturer's Data: For information only, submit 2 copies of manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certifications as may be required to show compliance with these specifications.
 - 1. For deck fastening systems, submit ICC (International Code Council) evaluation reports.
- B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, cut openings, special jointing or other accessories. Submit one (1) electronic print for review and comment. Refer to Division 1 requirements.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Deck, Dimensions and Properties: Dimensions and properties of the various types of deck are shown on the drawings. Deck configurations shall be similar to that of the decks called for on the drawings. Allowable stresses shall be equal to that of the deck specified on the drawings.
- B. Deck Coating: Galvanized, ASTM A653, G90.
- C. Miscellaneous Steel Shapes: ASTM A36.

- D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Deck sheets shall be erected and welded to supports in accordance with the manufacturer's specifications and erection layouts and as required to resist the uplift loads, if any, noted on the drawings.
- B. Side joints must be fastened together in accordance with manufacturer's specifications. Cutting openings through the deck less than 16 square feet in area, and all skew cutting shall be performed in the field. Deck shall be continuous over three (3) or more spans.
- C. Except where other permanent type edge closures are shown on the drawings, provide sheet metal edge closures around the perimeter of all steel deck areas, including openings, where concrete is to be applied to the deck. Deck closures shall be of proper gage and configuration to retain the wet concrete.

3.02 TOUCH-UP

- A. All damaged coating, including welds, shall be touched up with an approved coating before placing fill.

END OF SECTION

COLD FORMED METAL FRAMING**SECTION 05400****PART - GENERAL****1.01 SECTION INCLUDES**

- A. Cold formed-steel exterior wind loaded galvanized wall stud framing and framing of openings.
- B. Interior cold-formed steel wall stud framing heavier than 20 gauge, prime painted finish, gauge on drawings; loading of 5 psf with L/360 deflection limit.
- C. Framing accessories. Deflection tracks at overhead structure and horizontal bridging. All horizontal bridging shall be mechanically attached to the studs

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Metal fabrications for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
- B. Section 06100 - Carpentry: Rough wood blocking within and attached to stud framing.
- C. Section 09260 – "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.03 REFERENCES

- A. AISI S100–North American - Specifications for the Design of Cold-Formed Steel Structural Members.
- B. AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provisions."
- C. AISI S240, "North American Standard for Cold-Formed Steel Structural Framing."
- D. ASTM A653 - Steel Sheet, Zinc- Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
- E. ASTM A1003 - Steel Sheet, Carbon, Metallic and Nonmetallic Coated by the Hot-Dip Process.
- F. ASTM A90 – Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- G. ASTM C955 –Standard Specification for Cold-Formed Steel Structural Framing Members
- H. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- I. SFIA – Steel Framing Industry Association

- J. AWS D1.3 Structural Welding Code-Sheet Steel.
- K. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.04 SYSTEM DESCRIPTION

- A. Metal stud framing system with exterior sheathing specified in Section 092116, waterproof membrane applied to sheathing specified in Section 07130, insulation, interior gypsum board and drywall finishing specified in Section 092116.
 - 1. Studs: C-shape galvanized steel with depth and gauge indicated on the Drawings, unless heavier gauge required for specified performance, but in no case less than 16 gauge at 16 " o.c.

1.05 PERFORMANCE

- A. Calculate structural properties of framing members in accordance with AISI S100 "Specification for the Design of Cold-Formed Steel Structural Members".
 - 1. Design structural elements under by a Professional Structural Engineer experienced in design of structural building framing members who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- B. Design and size components, connections, bracing, etc. to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as required by and calculated in accordance with the International Building Code 2021, based on wind pressures indicated on the S-series drawings, and corners as required by the codes; also withstand all dead loads of attached/bearing construction.
 - 1. Minimum gauge of 16 gauge or heavier if required by specified loads, maximum stud spacing is 16" o.c.
- C. Maximum Allowable Deflection: L/240 at metal panels, L/600 for masonry.
- D. System shall provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- E. System shall accommodate construction tolerances, deflection of building structural members, and clearances of intended openings in accordance with AISI S100 Publication "Specifications for Design of Cold-Formed Steel Structural Members".
- F. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing to comply with AISI S100 and AISI S240.

1.06 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Provide shop drawings prepared by cold-formed steel framing manufacturer. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, type and location of fasteners, and accessories or items required of other related work.

- C. Describe method for securing studs to tracks, and for blocking and reinforcement to framing connections.
- D. Provide calculations for loadings and stresses of walls, specially fabricated framing, under a Professional Structural Engineer's seal.
- E. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Research Reports:
 - 1. For cold-formed steel framing from a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Steel framing manufacturer to have a third-party evaluation report for its products that are reviewed to the local building code or its model code (IBC 2021 and AISI S100).

1.07 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this section with minimum three years documented experience.
 - 1. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.
 - a. Products to be certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies

1.08 COORDINATION

- A. Coordinate with the placement of components within the stud framing system.

1.09 QUALITY ASSURANCE

- A. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel".
- B. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.
- C. Product Tests: Mill certificates or data from a qualified independent testing agency[, or in-house testing with calibrated test equipment,] indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- D. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA), or be a part of a similar organization that provides verifiable

code compliance program.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. ClarkDietrich or equal member in good standing of the Steel Framing Industry Association (SFIA)

2.02 FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S240 for conditions indicated.
 - 1. Grade: For 18 gauge and lighter comply with AISI S240/ASTM A653, Grade 33, 33,000 psi minimum yield point. For 16 gauge and heavier comply with AISI S240/ASTM A653, Grade 50, 50,000 psi minimum yield point.
 - 2. Coating: CP 90: G90 (Z275)
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 1003/A 1003M, ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1, As required by structural performance.
 - 2. Coating: CP 90: G90 (Z275).
- C. Steel for Track, Bridging and Accessories: AISI S240/ASTM A653, 33,000 psi minimum yield point.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC - Paint 20, Type II Organic zinc rich.
- E. Studs: Manufacturer's standard C-shaped load bearing steel studs of size, shape and gauge indicated and/or required, with a minimum 2" flange and flange return lip. Provide depth of studs as noted.
 - 1. Note that the studs framing all openings shall be non-punched, solid studs.
- F. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges.
 - 1. Product: ClarkDietrich; U-shaped steel track, or comparable product.
- G. Headers and Jambs - Heavy-Duty Stud: Manufacturer's proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.
 - 1. ClarkDietrich; HDS Heavy-Duty Stud (HDS) and Type HDSC Header Bracket or comparable product.

- H. Slotted Deflection: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure.

- 1. ClarkDietrich; MaxTrak Slotted Deflection Track or comparable product.

2.03 FASTENERS

- A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM A90, hot dip galvanized.
- B. Anchorage Devices: Power driven, power actuated, drilled expansion bolts, or screws with sleeves.
- C. Welding: In conformance with AWS D1.3.

2.04 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed galvanized sheet steel thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

2.05 FABRICATION

- A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.
 - 1. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
- B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.
 - 1. Wire tying of framing components is not permitted.
- C. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet. All members shall be fabricated to within + or - 1/8" of the required length
- D. Fabricate assemblies of framed sections to sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.
- E. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- F. Welding shall be performed in accordance with AWS D1.1

2.06 FINISHES

- A. All exterior studs, tracks, bridging and accessories shall be galvanized to CP 60: G60 or CP 90: G90 coating class meeting AISI S240/ASTM A653.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are ready to receive work.
- B. Verify that rough-in utilities are in proper location.

3.02 ERECTION

- A. Install cold-formed steel framing in accordance with ASTM C 1007 and AISI S240, and manufacturer's written instructions unless more stringent requirements are indicated. Align and secure top and bottom runners to resist the indicated design pressures, with a minimum of one #8 screw in each flange of every stud. The maximum gap between either end of any stud and the top or bottom track shall be 1/16".
- B. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element, or they shall be butt-welded or spliced together.
- C. 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.
- D. Studs shall be installed in a manner in which will assure that ends of the studs are positioned against the inside track web, prior to stud and track attachment.
- E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- F. Unless otherwise noted, install studs vertically at 16 inches oc.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks by welding or by other methods when approved by the Architect/Engineer. Studs shall be plumbed, aligned, and welded to both flanges of both the upper and lower tracks.
- I. Stud splicing is not permissible.
- J. Jack studs or cripples shall be installed below window sills, above window and door heads, and elsewhere to furnish support, and shall be securely attached to supporting members.
- K. Bridging for studs shall be attached in a manner to prevent stud rotation. Bridging rows shall be spaced equally as recommended by the manufacturer of the system, but not to exceed 3'-4" o.c.
- L. Coordinate erection of studs with requirements of door and window frames; install supports and attachments. Jack studs or cripples shall be installed below window sills, above window and door heads, and elsewhere at the same spacing as wall studs. They shall be securely attached to supporting members
- M. Construct corners using three studs.
- N. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and

mechanical work to be placed within or behind stud framing.

- O. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.
- P. Frame wall openings larger than 2'-0" square with a minimum of double studs at each jamb of frame except where more than two are shown or indicated in manufacturer's instructions to meet performance criteria for size of opening. . Install runner tracks jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated. Where multiple studs are required at window jambs, door jambs, or the sides of other openings they shall be attached to each other sufficiently to work as a unit to resist all loads from the opening.
- Q. Install supplementary framing, blocking, and bracing in metal framing system wherever walls are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- R. Touch-up field welds and damaged galvanized surfaces with zinc rich primer.

3.03 ERECTION TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.
- C. Maximum Variation From Plumb: 1/8 inch.

END OF SECTION

METAL FABRICATIONS**SECTION 05500****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated ferrous metal items, galvanized and prime painted with principal items listed below. Refer to Drawings for items not specifically listed.
 - 1. Rough hardware
 - 2. Elevator pit ladders (steel or aluminum).
 - 3. Exterior aluminum ladder (Over parapet type with security door and safety cage))
 - 4. Miscellaneous supports at overhead doors.
 - 5. Bollards

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Division 3 - Concrete: Work: Placement of metal fabrications in concrete.

1.03 RELATED SECTIONS

- A. Section 05120 - Structural Steel: Structural steel column anchor bolts.
- B. Section 05522 - Handrails and railings systems.
- C. Section 099000 - Painting: Paint finish.

1.04 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
- D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
- F. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- G. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- H. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.
- I. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round

and Shapes.

- J. AWS A2.0 - Standard Welding Symbols.
- K. AWS D1.1 - Structural Welding Code.
- L. SSPC - Steel Structures Painting Council.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.06 QUALIFICATIONS

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the work.
- B. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the project is being constructed.
- A. Welders Certificates: Submit under provisions of Section 01300, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.07 FIELD MEASUREMENTS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B.
- C. Plates: ASTM A283.

- D. Pipe: ASTM A53, Grade B, Schedule 40.
 - 1. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.
- E. Fasteners:
 - 1. Power Actuated Drive Pins: Fed. Spec. FF-P-395, style to suit material.
 - 2. Expansion Bolts (Shields): Fed. Spec. FF-S-325, except lead, fiber and plastic shields are not acceptable. Furnish bolts and screws required.
 - 3. Toggle Bolts: Fed. Spec. FF-B-588, except wire wings are not acceptable.
- F. Bolts, Nuts, and Washers: ASTM A325 or A307 as appropriate, galvanized to ASTM A153 for attachment to galvanized components.
- G. Gray-Iron Castings: ASTM A48, Class 30
- H. Malleable-Iron Castings: ASTM A47, Grade 32510 (ASTM A47M, Grade 22010).
- I. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
- J. Welding Materials: AWS D1.1; type required for materials being welded.
- K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications equal to products as follows:
 - 1. B-6 Construction Grout; W. R. Bonsal Co.
 - 2. Euco N-S Grout; Euclid Chemical Co.
 - 3. Five Star Grout; Five Star Products
 - 4. Crystex; L & M Construction Chemicals, Inc.
 - 5. Masterflow 928 and 713; Master Builders Technologies, Inc.
 - 6. Sealtight 588 Grout; W. R. Meadows, Inc.
 - 7. SonogROUT 14; Sonneborn Building Products-ChemRex, Inc.

2.02 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 - 1. Provide organic zinc rich primer complying with FS SSPC 20, Type II, at exterior work and work built into exterior walls.

- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.03 FABRICATION - GENERAL

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. 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, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.04 FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with

minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning".
 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning".
- B. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- C. Galvanize in accordance with ASTM A123 or ASTM A386, as applicable. Provide minimum 1.25 oz/sq ft galvanized coating.
1. Galvanize all items exposed to the exterior or built into exterior wall/roof construction.
 2. Do not apply passivating treatment for items which receive paint finish after erection.

2.05 ROUGH HARDWARE

- A. Furnish bent or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.06 EXTERIOR LADDERS

- A. Aluminum Ladders: Fabricate ladders with crossover for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3 and OSHA.
1. Equal to Model Number: "563 series-Handrails Over Roof with Parapet Return" by Alaco Ladder Co. and equal by Precision Ladder
 2. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum
Aluminum Finish: Mill finish
 3. Siderails: Continuous 1-3/4 inches (45 mm) wide by 3 inch (76 mm) tubes with 1/8 inch (3 mm) wall thickness
 4. Rungs: 1-1/8 inches (32 mm) wide by 1-1/4 inches (32 mm) tube with serrated surfaces and capable of 1,000 pound (455 kg) load. Space 12 inches (310 mm) on center. Attach rungs in centerline of side rails by welding.
 5. Support each ladder at top and bottom and at intermediate points spaced not more than 4'-0" o.c. by means of welded or bolted steel brackets.
 6. Wall Brackets: 2 inch (50 mm) by 1/4 inch (6 mm) minimum flat bar aluminum wall brackets.
 7. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided.
 8. Rest Platform - platforms consist of GripStrut® floors, 4" (102 mm) high toe boards, 1-1/4"

- (32 mm) round serrated tube guard railings and cast aluminum railing fittings
8. Security Door: ladder manufacturers standard aluminum hinged panels with lock.

2.07 LADDER SAFETY CAGES

- A. General: Fabricate ladder safety cages to comply with ANSI A14.3; assemble by welding.
- B. Fabricate from 2 inches (50 mm) wide by 1/4 inch (6 mm) thick aluminum vertical strips and horizontal loops welded for form a cage around the ladder.
- C. Bottom Loop Radius: 17-1/2 inches (445 mm).
- D. Radius of Other Loops: 13-1/2 inches (343 mm).
- E. Vertical Strips: 7 vertical strips equally spaced around perimeter of cage.
- F. Horizontal Loops: 48 inches (1220 mm) maximum spacing.
- G. Minimum clearance from ladder to back of cage shall be 27 inches (686 mm).
- H. Cage Start Above Grade: 8 feet (2440 mm).
- I. Extend safety cage 42 inches (1065 mm) minimum above top rung and attach to side rails as detailed on approved shop drawings.
- J. Wall Brackets: 2 inch (50 mm) by 1/4 inch (6 mm) minimum flat bar aluminum wall brackets

2.08 ELEVATOR PIT LADDER

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3 and OSHA.
- B. Siderails: Continuous steel flat bars, 3/8 inch x 3 inches , with eased edges, spaced 20-1/4 inch apart. At elevator pits, extend siderails 48 inches above floor level
- C. Bar Rounds: Round steel bars, 14 inch diameter, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 3'-0" o.c. by means of welded or bolted steel brackets.
- F. Size brackets to support design dead and live loads required and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of

structural steel framework as required to complete the work.

- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is places.
 - 2. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.11 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 80 steel pipe. Cap bollards with 1/4 inch minimum steel plate.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4 inch thick steel plate welded to bottom of sleeve.
- C. Design and construct bollards to resist a horizontal force of 1,000 lbs. per ft. applied outwardly not less than 27 inches above the parking surface.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- C. Center nosings on tread widths with noses flush with riser faces and tread surfaces.
- D. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings or shop drawings as follows:
 - 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- D. Perform field welding in accordance with AWS D1.1.
- E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- F. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- G. 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- H. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- I. Ladders: Install ladder system in strict accordance with manufacturer's printed instructions. Install top of the top rung, level with top of access/egress level or landing platform, served by the ladder stepping-off surface and space rungs 12" (305 mm) on centers to bottom rung. Install parapet railing 42" (1067 mm) above top rung, then extend horizontally and return to roof or the rear of the parapet.

3.01 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a 2.0 mil minimum dry film thickness.
 - 2. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Section 09900 - Painting.
 - 3. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply

galvanizing repair paint to comply with ASTM A780.

3.02 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

METAL STAIRS**SECTION 05510****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. At enclosed Exit Stairs and the Mezzanine stair provide prefabricated/engineered metal stair system with closed risers complete with all supports including horizontal header and landing channels with vertical support (steel angle struts, columns, etc. as required) independent of main building structural framing and galvanized checker plate treads, & landings and closed risers. These stairs include steel railing systems specified herein.
- B. Lobby monumental Stair includes custom fabricated stainless steel checker plate treads & perforated risers below with stainless steel railings specified in Section 05730 and custom steel framing primed for paint finish.
 - 1. Stainless steel slip resistant minimum 3/16" thick checker plate stair treads and landings and 1/8" thick stainless steel perforated metal at risers as a part of the stairs Mill finish; ASTM A569Type 302/304

1.02 RELATED SECTIONS

- A. Section 05120 - Structural Steel: Bearing plates or angles for metal stairs, including anchorage if not supplied with the stair system.
- B. Section 09900 - Painting: Paint finish.

1.03 REFERENCES

- A. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability For Physically Handicapped People.
- C. ASTM A36 - Structural Steel.
- D. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
- 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 A569 - Steel, Carbon (0.15 Maximum Percent), Hot-Rolled-Sheet and Strip,

Commercial Quality.

- J. AWS A2.0 - Standard Welding Symbols.
- K. AWS D1.1 - Structural Welding Code.
- L. SSPC - Steel Structures Painting Council.

1.04 DESIGN REQUIREMENTS

- A. Design and Fabricate stair assembly to support live load of 100 lb/sq ft with deflection of stringer or landing framing not to exceed 1/180 of span and a concentrated load of 300 lbs. placed upon an area of 2-1/2 feet square or so located as to produce maximum stress condition.
- B. Size and Spacing of Handrails: The diameter or width of the gripping surfaces of a handrail shall be 1-1/4 inch to 1-1/2 inch or the shape shall provide an equivalent gripping surface. If handrails are mounted adjacent to a wall, the space between the wall and the grab bar shall be 2-1/4 inch.
- C. Railing assembly, wall rails, and attachments to resist a horizontal thrust of 50 lbs. per ft. at the top of the railing and as follows, without damage or permanent set. The following is a requirement of article 4.26 of Federal Register, Vol. 56 No. 144, July 26, 1991, Rules and Regulations. Handrails Not Serving As Top Rails: Shall withstand the following loads: Concentrated load of 200 lbf applied at any point and in any direction
 - 1. Bending stress in a handrail induced by the maximum bending moment from the application of 200 lbf shall be less than the allowable stress for the material of the handrail.
 - 2. Shear stress induced in a handrail by the application of 200 lbf shall be less than the allowable shear stress for the material of the handrail. If the connection between the handrail and its mounting bracket or other support is considered to be fully restrained, then direct and torsional shear stresses shall be totaled for the combined shear stress, which shall not exceed the allowable shear stress.
 - 3. Shear force induced in a fastener or mounting device from the application of 200 lbf shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.
 - 4. Tensile force induced in a fastener by a direct tension force of 200 lbf plus the maximum moment from the application of 200 lbf shall be less than the allowable withdrawal load between the fastener and the supporting structure.
 - 5. Handrails shall not rotate within their fittings.
 - 6. Handrails and Top Rails of Guards:
 - Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - Uniform and concentrated loads need not be assumed to act concurrently
- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor is 1.5.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate profiles, sizes, supports, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.06 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Louisiana.
- B. Welders' Certificates: Submit under provisions of Section 01300 certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Drawings or shop drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS (enclosed Exit Stairs and the Mezzanine stair)

- A. American Stair.
- B. The Sharon Companies Ltd.
- C. Lapeyre Stair

2.02 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B.
- C. Plates: ASTM A283.
- D. Pipe: ASTM A53, Grade B Schedule 40.
- E. Sheet Steel: ASTM A446, Grade B Structural Quality.
- F. Concrete for Treads and Landings: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

- G. Tread and Landing Concrete Reinforcement: Mesh, unfinished.
- H. Checker Plate: ASTM A569, slip resistant raised medium pattern steel decking.
- I. Bolts, Nuts, and Washers: ASTM A307.
- J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.
- K. Welding Materials: AWS D1.1; type required for materials being welded.
- L. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide chromate primer.

2.03 FABRICATION - GENERAL

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Continuously seal jointed pieces by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Accurately form components required for anchorage of stairs, landings and railings to each other and to building structure.

2.04 FABRICATION - CHECKER PLATE TREADS AND LANDINGS

- A. Fabricate stairs and landings with closed risers and treads of 3/16" thick checker plate steel.
- B. Form risers, and treads of minimum 1/8" as required commercial grade, hot-rolled sheet steel stock, 1/8" thick checker plate for landings.
- C. Form stringers with sheet steel stock, with thickness required for loading requirements.
- D. Reinforce underside of landings with angles of T's to attain design load requirements.
- E. Prime paint all components except treads.

2.05 RAILINGS

- A. Railings shall be fabricated of 1-1/2", 14 gauge square tube horizontal system as indicated on

the Drawings. Railings and supports shall be of welded flush construction with all exposed welds ground smooth.

- B. Wall rail shall be of 1-1/2" members as indicated on the Drawings with closed ends and return to wall.
- C. Provide either cast or wrought iron wall brackets for securing pipe handrails at stairs along wall lines. Brackets shall have rounded seat drilled for screwing from underside to handrail. Brackets shall be spaced not over 4'-0" o.c., bolted to walls.
- D. Top rail shall be continuous without interruption.
- E. Spacing of railing members shall not exceed 4 inches as required by NFPA 101.
- F. Provide metal escutcheon plates where handrail returns to or terminates at wall.
- G. Railings at spiral stairs shall be continuous 1½" round pipe rail radiused to conform with stair circular profile.
- H. Cast-in-Place and Post installed Rail Anchors: Anchors of type required, fabricated from corrosion-resistant materials, capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified, independent testing agency.

2.06 FINISHES

- A. Prepare surfaces to be primed in accordance with SSPC SP 2.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime paint all components with one coat.

2.08 STAINLESS STEEL STAIR COMPONENTS

- A. Fabricate metal base of materials and thicknesses indicated, of the size and style indicated on the drawings. Form units with sharp corners, true lines and accurate profiles, and free from distortion and warp.
- B. Stainless Steel: Commercial quality stainless steel checker plates, sheets, AISI Type 302 or 304, complying with ASTM A167.
 - 1. Finish: Non-directional No 4 finish.
- C. Stair Risers: Perforated stainless steel equal to "ROUND SLOT, STAGGERED Patterns" by Diamond Manufacturing Co. or equal and as follows; Type 302 or 304

:

- 1. Thickness: 14 gauge

2. Slot dimensions: 0.1250 x 1.0000
3. Center dimensions: 0.2500 x 1.1250
4. 4.6 holes per inch and 43.3 % open area

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be embedded in drywall construction with setting templates, to appropriate sections.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments..
- D. Field weld components indicated on Drawings and shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.
- H. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.05 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 2-1/4 inch

clearance from inside face of handrail to finished wall surface.

- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and wall return fittings to building construction as follows:
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 - 2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
 - 3. For hollow masonry anchorage, use toggle bolts with square heads.
 - 4. For steel-framed gypsum board assemblies, fasten brackets directly to minimum 20 gauge concealed anchors using self-tapping screws of size and type required to support structural loads.

END OF SECTION

ORNAMENTAL METAL FABRICATIONS**SECTION 05700****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated ornamental ferrous metal items, factory finished, with principal items listed below.
 - 1. Stainless steel base (MB-1); see drawings for height.
 - 2. Stainless steel wall panel (WM-1), 20 gauge on MDF core board.

1.02 REFERENCES

- A. ASTM 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- B. AWS A2.0 - Standard Welding Symbols.
- C. AWS D1.1 - Structural Welding Code.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product data for each product used in ornamental metal and fiberglass work, including finishing materials and methods.
- C. Shop drawings showing fabrication and installation of ornamental metalwork including plans, elevations, details of components, and attachments to other units of work. Indicate materials and profiles of each ornamental metal member, fitting, joinery, finishes, fasteners, anchorages, and accessory items.
- D. Samples of each profile and pattern of fabricated metal and each type of metal finish required, prepared on metal of same thickness indicated for final unit of work.

1.04 QUALIFICATIONS

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the work.

1.05 FIELD MEASUREMENTS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless Steel: ASTM A167, plate and sheets, stretcher leveled, Type 302/304 at interior locations and Type 316 at exterior locations

2.02 FABRICATION

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. 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
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius
- E. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces

2.03 FINISHES

- A. Stainless Steel: Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform, non-directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece
 - 1. Satin Polish: No. 4 finish. Non-directional finish. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean. Stair treads to be mill finish.

2.07 STAINLESS STEEL BASE

- A. Fabricate metal base of materials and thicknesses indicated below, of the size and style indicated on the drawings.. Form units with smooth flat faces, sharp corners, true lines and accurate profiles, and free from distortion and warp. .

- B. Stainless Steel: Commercial quality stainless steel plates, sheets and/or strips, AISI Type 302 or 304, complying with ASTM A167.
 - 1. Provide minimum 20 gauge.
 - 2. Finish: Non-directional No 4 finish.
- C. Size: see Drawings:
- D. Application: Adhesive application; no exposed fasteners.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.
- C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that cannot be shop-welded because of shipping size limitations.

3.03 PROTECTION

- A. Protect finishes of ornamental metalwork from damage during construction period with temporary protective covering approved by ornamental metalwork fabricator. Remove protective covering at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit; or provide new units as required.

END OF SECTION

STAINLESS STEEL RAILING SYSTEM**SECTION 05730****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Interior stainless steel railings, ballusters and fittings with components as indicated on the drawing, all welded construction,
- B. Railings associated with enclosed interior pre-engineered exit stairs are specified as part of those systems in Section 05510.
- C. See Railing Component schedule at the end of this section listing components parts of railing systems based on products by Julius Blum or equal by C.R. Laurence and Blumcraft

1.02 RELATED SECTIONS

- A. Section 05510 - Metal Stairs: Handrails integral with pre-engineered interior metal stairs.

1.03 REFERENCES

- A. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. ASTM A167 – Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- D. ASTM 312/A 312M – Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
- H. AWS D1.1 - Structural Welding Code.
- I. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- J.

1.04 QUALITY ASSURANCE / DESIGN REQUIREMENTS

- A. Railing assemblies and attachments shall be designed, fabricated, and installed in accordance with ASTM A1264, ASTM E894, ASTM E935 to support. Also comply with requirements of the American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. Anchors shall be fabricated from stainless steel materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488. Railings shall have high strength stainless steel in order to comply with 1.4.1 with adequate safety margin.
- C. Railing assembly, wall rails, and attachments shall resist a horizontal thrust of 50 lbs. per ft. applied to the top of the railing and shall withstand a two hundred (200) lb. Force applied to rail from any direction and as follows, without damage or permanent set.

1. Bending stress in a handrail induced by the maximum bending moment from the application of 200 lbf shall be less than the allowable stress for the material of the handrail.
 2. Shear stress induced in a rail by the application of 200 lbf shall be less than the allowable shear stress for the material of the handrail. If the connection between the handrail and its mounting bracket or other support is considered to be fully restrained, then direct and torsional shear stresses shall be totaled for the combined shear stress, which shall not exceed the allowable shear stress.
 3. Shear force induced in a fastener or mounting device from the application of 200 lbf shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.
 4. Tensile force induced in a fastener by a direct tension force of 200 lbf plus the maximum moment from the application of 200 lbf shall be less than the allowable withdrawal load between the fastener and the supporting structure.
 5. Handrails shall not rotate within their fittings.
- D. Comply with Consumer Product Safety Commission 16 CFR 1201 and other applicable safety requirements.
- E. Engineer Qualifications: Professional engineer legally authorized to practice in the State of Louisiana and experienced in providing engineering services of the kind indicated for handrails and railing systems similar to this Project in material, design, extent, and that have a record of successful in-service performance.

1.05 SUBMITTALS

- A. Product data: Technical data on the handrail system including: catalogs, material compliance sheets and material safety data sheets. Submit complete results of product tests which show that their product meets all performance requirements outlined in this specification. All test results must be certified by a Professional Engineer. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate plans showing location of handrail required for the project with all necessary dimensions profiles, sizes, connection attachments, anchorage, size, finishes and type of fasteners, and accessories.
- C. Samples: Supply a railing sample complete with top and mid-rails, multiple posts, toe plate and toe plate attachment as well as base mounting system if required by project drawings. Submit two (2) samples of handrail finish.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless Steel: ASTM A269, Type 320/304 with No. 4 brushed finish at handrails and polished fittings. Provide materials which have been selected for their surface flatness,

smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed surfaces which exhibit pitting, seam marks, roller marks, “oil-canning”, stains, discolorations or other imperfections on the finished units will not be acceptable

- G. Fasteners for Interconnection Handrails and Railing Components: Select tamperproof fasteners of type, grade and class required. Fasteners shall be fabricated from Type 304 stainless steel. Provide bolts where indicated on the drawings.
 - a. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railing to other types of construction indicated and capable of withstanding design loads. Fasteners shall be fabricated from Type 304 or 316 stainless steel.

2.02 RAILING COMPONENTS

- A. Stainless Steel: ASTM A269, Type 320/304 with No. 4 brushed finish
- B. Rails and Posts: Shapes indicated on Drawings, welded joints.
- C. Fittings: wall brackets, escutcheons.
- D. Mounting: Brackets and flanges, with steel inserts for casting in concrete, with steel brackets for embedding in masonry. Prepare backing plate for mounting in drywall wall construction.
- E. Welding Materials: AWS D1.1; type required for materials being welded

2.03 FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads. Shear, punch, laser or water-jet cut material cleanly and accurately. Remove burrs from exposed cut edges
- B. After fabrication, provide protective PVC film on handrails, posts, and other exposed to view components to be removed after installation.
- C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work
- D. Tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

- F. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.

2.05 FINISHES

- A. Stainless Steel: All stainless steel components shall have finish indicated and to be passivated after finish is applied to remove any foreign substances finish. All finishes to be provided evenly without significant changes in coloration and texture

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, or installation.
- B. Supply items required to be cast into concrete or placed in partitions with setting templates, to appropriate Sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions to comply with specified performance requirements. At cable railings, to insure proper bonding, the mating surfaces on all fittings and tubing need to be scuffed using a "Scotch-Brite" pad or sandpaper and wiped clean with a 50% alcohol solution. All gluing surfaces must be free of grease and dirt
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide anchors, plates or angles required for connecting railings to structure. Anchor railings securely to structure.
- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings. Field weld anchors as indicated on shop drawings. Grind welds smooth. Touch-up welds with specified galvanize primer. At cable railings, all run-outs and corner connections must be secured with a 1/8" stainless steel pop rivet. This will prevent the tube from pivoting or sagging while the adhesive cures. The rivet should be located on the underside of the railing to minimize visibility and contact. The rivet should be placed in the fitting nearest to the bend in the tube and drilled 1/2" from the tube end

- E. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Set posts plumb within a tolerance of $\frac{1}{4}$ inch in 7 feet. Maximum offset from true alignment for every 50-foot of railing shall be $\frac{1}{4}$ ", non-accumulative.
- F. Railings shall be cleaned, including infill cables. Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.

3.04 RAILING COMPONENT SCHEDULE

<u>Manufacturer</u>	<u>Part No</u>	<u>Description</u>	<u>Finish</u>	
Julius Blum	#223	Handrail Wall Bracket	Stainless Steel	1
Julius Blum	#6503	Handrail	Stainless Steel	

END OF SECTION

GLASS RAILING SYSTEM**SECTION 05731****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Interior glass railing system with “low iron” 9/16” laminated HS glass with .09 SentryGlass innerlayer glass and stainless steel metal components as indicated on the drawings, including one piece aluminum shoe with V-wedge structural element to secure the glass with resilient gasket infill at glass and stainless steel enclosure at the base for concealed fastener installation. The glass shall comply with Section 08800 and herein, and be free of any distortion, blemishes, air bubbles, prickling, etc. interfering with the clarity of the glass for viewing through the glass. Aluminum shoe indicated on the drawings – non-grouted installation equal to Julius Blum and Trex Commercial Products. Glass units as follows:
 - 1/4” HS Low Iron
 - .090” SentryGlass clear interlayer
 - 1/4” HS Low Iron

1.02 RELATED SECTIONS

- A. Section 05510 - Metal Stairs: Handrails integral with pre-engineered interior metal stairs.

1.03 REFERENCES

- A. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. ASTM A167 – Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- D. ASTM 312/A 312M – Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
- E. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- G. ASTM A1264 - Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems.
- H. ASTM E894 - Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

1.04 QUALITY ASSURANCE / DESIGN REQUIREMENTS

- A. Railing assemblies and attachments shall be designed, fabricated, and installed in accordance with ASTM A1264, ASTM E894, ASTM E935 to support. Also comply with requirements of the American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. Anchors shall be fabricated from stainless steel materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

Railings shall have high strength stainless steel in order to comply with 1.4.1 with adequate safety margin.

- C. Railing assembly, wall rails, and attachments shall resist the following loads
 - 1. Handrails and Guards. Handrails and guards shall be designed to resist a load of 50 pounds per linear foot (plf) (0.73 kN/m) applied in any direction at the top, and to transfer this load through the supports to the structure.
 - 2. Concentrated Load. Handrails and guards shall be able to resist a single concentrated load of 200 pounds (0.89 kN) applied in any direction at any point along the top, and to transfer this load through the supports to the structure.
 - 3. Intermediate Rails. Intermediate Rails (all those except the handrail), balusters, and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area equal to 1 square foot, including openings and space between rails.
 - 4. Handrails shall not rotate within their fittings.
- D. Comply with Consumer Product Safety Commission 16 CFR 1201 and other applicable safety requirements.
- E. Engineer Qualifications: Professional engineer legally authorized to practice in the State of Louisiana and experienced in providing engineering services of the kind indicated for handrails and railing systems similar to this Project in material, design, extent, and that have a record of successful in-service performance.
- F. Manufacturers: Julius Blum, C.R. Laurence, Livers Bronze Viva and HDI Railing Systems, contingent on manufacturer accommodating the specified glass thicknesses

1.05 SUBMITTALS

- A. Product data: Technical data on the handrail system including: catalogs, material compliance sheets and material safety data sheets. Submit complete results of product tests which show that their product meets all performance requirements outlined in this specification. All test results must be certified by a Professional Engineer. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate plans showing location of handrail required for the project with all necessary dimensions profiles, sizes, connection attachments, anchorage, size, finishes and type of fasteners, and accessories.
- C. Samples: Supply a railing sample complete with top and mid-rails, multiple posts, toe plate and toe plate attachment as well as base mounting system if required by project drawings Submit two (2) samples of handrail finish.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless Steel: ASTM A269, Type 302/304 at interior systems, with No. 4 brushed finish at handrails and polished fittings. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed surfaces which exhibit pitting, seam marks, roller marks, “oil-canning”, stains, discolorations or other imperfections on the finished units will not be acceptable
- F. Fasteners for Interconnection Handrails and Railing Components: Select tamperproof fasteners of type, grade and class required. Fasteners shall be fabricated from Type 316 stainless steel. Provide bolts where indicated on the drawings.
 - a. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railing to other types of construction indicated and capable of withstanding design loads. Fasteners shall be fabricated from Type 304 stainless steel.
- G. Low-Iron Glass: “Starphire Ultr-clear” by PPG, St Gomain “Diamant or Chrystal Clear” or Pilkington “Optiwhite” or equal by Bendheim, with 91% visible light transmission, “low iron” glass complying with Section 08800. Fabricators performing the glass tempering shall be one of the following. The glass shall be free of any distortion, blemishes, air bubbles, prickling, etc. interfering with the clarity of the glass for viewing through the glass.
 - 1. Viracon Glass – Minnesota.
 - 2. Arch Aluminum and Glass – Miami, Florida
 - 3. ACI Glass – Farmers Branch, Texas (Vitro America, Farmers Branch 800-284-4527)

2.03 FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads. Shear, punch, laser or water-jet cut material cleanly and accurately. Remove burrs from exposed cut edges
- A. After fabrication, provide protective PVC film on handrails, posts, and other exposed to view components to be removed after installation.
- B. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work
- C. Tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

- E. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.

2.05 FINISHES

- A. Stainless Steel: All stainless steel components shall have finish indicated and to be passivated after finish is applied to remove any foreign substances finish. All finishes to be provided evenly without significant changes in coloration and texture

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, or installation.
- B. Supply items required to be cast into concrete or placed in partitions with setting templates, to appropriate Sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions to comply with specified performance requirements. At cable railings, to insure proper bonding, the mating surfaces on all fittings and tubing need to be scuffed using a "Scotch-Brite" pad or sandpaper and wiped clean with a 50% alcohol solution. All gluing surfaces must be free of grease and dirt
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide anchors, plates or angles required for connecting railings to structure. Anchor railings securely to structure.
- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings. Field weld anchors as indicated on shop drawings. Grind welds smooth. Touch-up welds with specified galvanize primer. At cable railings, all run-outs and corner connections must be secured with a 1/8" stainless steel pop rivet. This will prevent the tube from pivoting or sagging while the adhesive cures. The rivet should be located on the underside of the railing to minimize visibility and contact. The rivet should be placed in the fitting nearest to the bend in the tube and drilled 1/2" from the tube end
- E. Attach glass panels to posts and rails using glass clips and grips as detailed on approved shop drawings

- F. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Set posts plumb within a tolerance of $\frac{1}{4}$ inch in 7 feet. Maximum offset from true alignment for every 50-foot of railing shall be $\frac{1}{4}$ ", non-accumulative.
- G. Railings shall be cleaned, including infill cables. Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.
- I. After erection, prime welds and abrasions of railings

END OF SECTION

CARPENTRY

SECTION 06100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Blocking in walls for miscellaneous nailers and supports for all wall hung items, i.e. garb bars, cabinets, etc.
- B. Telephone and electrical panel backboards, fire retardant treated.
- C. Preservative treatment of wood members at exterior openings and blocking at roofs.
- D. Plywood wainscot wall panels for paint finish.
- E. Hardware and attachment accessories.

1.02 REFERENCES

- A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- B. APA: American Plywood Association.
- C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- D. AWWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.
- E. AWWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.
- F. NHLA (National Hardwood Lumber Association).
- G. NFPA: National Forest Products Association.
- H. PS 1 - Construction and Industrial Plywood.
- I. PS 20 - American Softwood Lumber Standard.
- J. SPIB: Southern Pine Inspection Bureau.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories to a minimum scale of 1-1/2 inch to 1 ft
- C. Product Data: Provide technical data on wood preservative materials and application

instructions.

- D. Certification of Treating Plant: Wood Preservatives: Submit certificate stating water-borne chemical and process used, net amount of preservative retained, and compliance with applicable standards. Include statement that moisture content of treated lumber was reduced to a maximum of 15% prior to shipment to site.

1.04 QUALITY ASSURANCE

- A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).
- B. Lumber Standard: Comply with PS 20, except as otherwise indicated.
- C. Plywood Standard: Comply with PS 1, and APA grade trademarks.
- D. Factory mark each piece of lumber and plywood with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
- E. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.
- F. Pressure-treated lumber shall conform to AWPAs requirements for preservative or fire-retardant treated materials. Treatment plant shall be licensed by manufacturer of treated material.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Protect work from moisture damage.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.07 COORDINATION

- A. Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lumber Grading Rules: NFPA and SPIB.
- B. Miscellaneous Blocking: No. 2 Southern Yellow Pine, 15 percent maximum moisture content, pressure preservative treat.

- C. Plywood Backboards: APA-Rated Sheathing, Grade C-D, plugged with exterior glue, sanded, fire retardant treated, 3/4" thick, each piece bearing U.L. label.
- D. Plywood Wainscot Wall Panels APA A-B for paint finish, Exposure 1 with exterior glue, thickness as indicated with.

2.02 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: 300 series stainless steel for treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

2.03 FACTORY WOOD TREATMENT

- A. Fire retardant: AWPAs Treatment C20, Interior Type, chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 /450.
 - 1. Provide at telephone and electrical backboards.
- A. Wood Preservative: AWPAs Treatment C2, ACQ (Alkaline Copper Quat) preservative, with a minimum of 0.40 lb/cu./ft. retainage (rated for contact with water). After treatment, kiln-dry lumber to a maximum moisture content of 19% .
 - 1. To prevent deterioration of fasteners and anchors, all anchors and fasteners in contact with the treated wood and plywood shall be 300 series stainless steel, including fasteners for attachment of the treated wood and plywood, and also fasteners and anchors for securing building components (doors, windows, roofing, etc.) into and through the treated wood and plywood. Also, any treated wood in contact with aluminum and ferrous or galvanized steel products shall be isolated from the metal by installing a layer of self adhering modified bitumen sheet or equal (felt is not permitted) to the metal prior to installing the wood and plywood.
 - 2. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 3. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPAs M4 to cut surfaces.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set members level and plumb, in correct position.
- B. Construct curb members of single pieces.

- C. Install telephone and electrical panel boards with fire retardent treated plywood. Over size the panel by 12 inches on all sides.
- D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- E. Locations for pressure treated lumber as follows:
 - 1. Use pressure-treated decay and insect resistant lumber for blockings and nailing strips in contact with masonry, concrete, roofing, steel, framing setting on and in contact with concrete, decking and blocking in contact with exterior wall openings.
 - 2. Apply two (2) drenching coats of preservative compatible with treatment to job cut edges of lumber.
- F. Note: Coat all ends of new wood which is bearing on or in contact with masonry walls with copper Napthenate conforming to AWWPA Spec. M4.

3.02 INSTALLATION OF PLYWOOD

- A. Comply with recommendations of the American Plywood Association (APA), for the installation of plywood.

END OF SECTION

ARCHITECTURAL WOODWORK

SECTION 06410

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Plastic laminate finished casework.
- B. Provide all wood blocking required for attachment of architectural woodwork, complying with Section 06100.
- C. Quartz tops are specified in Section 06614

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Grounds and support framing.
- B. Division 15: Plumbing fixtures and trims.

1.03 REFERENCES

- A. ANSI/BHMA A1156.9 - Cabinet Hardware
- B. AWI - Quality Standards
- C. FS MM-L-736 - Lumber, Hardwood
- D. FS MMM-A-130 - Adhesive, Contact
- E. National Electrical Manufacturers Association (NEMA) LD3 - High Pressure Decorative Laminates
- F. PS-1 - Construction and Industrial Plywood
- G. PS-20 - American Softwood Lumber Standard

1.04 SUBMITTALS

- A. Submit under provision of Section 01300.
- B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Shop Drawings: Include plans, indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, schedule of finishes and as follows:
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking and hanging strips, including concealed blocking and reinforcing specified in other sections.

3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
- D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 1. Plastic laminates.

1.05 QUALITY ASSURANCE

- A. Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
- B. Prior to installation of custom casework, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.
- C. Provide custom casework and trim conforming to the following Architectural Woodwork Institute (AWI) Quality Standards as a minimum requirement:
 1. Plastic Laminate Finished Casework:
 - a. AWI Section 400B - Custom Grade

1.06 QUALIFICATIONS

- A. Fabricator: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.
- B. Installer Qualifications: Arrange for architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to site under provisions of Section 01600.
- B. Protect units from moisture damage.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.9 COORDINATION

- A. Coordinate the work with plumbing and electrical rough-in.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS

- A. Wood Particleboard: PS 1; or AWI Standard, composed of wood chips, medium density, made with water resistant adhesive; of grade to suit application; sanded faces

2.02 LAMINATE MATERIALS

- A. Plastic Laminate: AWI 0.050 inch General Purpose quality, color, pattern, and surface texture as selected, high pressure application.
- B. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate.
- C. External Vertical Surfaces: 0.028 inch thick General Purpose quality (high-pressure), color, pattern, and surface texture as selected.
- D. Cabinet Linings: 0.020 inch thick, Cabinet Liner Type (high-pressure).

2.03 ACCESSORIES

- A. Adhesive: FS MMM-A-130 contact adhesive or type recommended by AWI or laminate manufacturer to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.
- D. Concealed Joint Fasteners: Threaded steel.

2.04 HARDWARE

- A. Hardware: ANSI/BHMA A156.9
- B. Shelf Standards and Rests:
 - 1. Plastic laminate finished casework:
 - a. Knape & Vogt Model 255 Standards
 - b. Knape & Vogt Model 256 Supports
 - 2. At loose shelving, provide wall standard/brackets equal to Knape & Vogt 87-187 Heavy Duty system.
- C. Drawer Pulls: see drawings finish as selected by Architect.
- D. Door Catches: Magnetic, commercial grade with a minimum 14 lb. pull.
- E. Cabinet Hinges: Stanley Series 1500 Series, self closing concealed units.

- F. Grommets: Doug Mockett & Company Model TG. Color as selected.
- G. Drawer Glides: Equal to Accuride 3832 series; size as required, steel ball bearing rollers, full extension type, rated at 100 lbs., full extension type. 200 lbs. rated at drawers more than 6 inches high or 24 inches wide
- H. Locks: E07121 for doors and E07041 for drawers
- I. Finish of exposed surfaces shall be ????????????????????

2.06 FABRICATION

- J. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- K. Fit shelves, doors, and exposed edges with 3/8 inch minimum matching hardwood edging. Veneer edge with panel for transparent finished casework. Use one piece for full length only.
- L. Cap exposed plastic laminate finish edges with materials of same finish and pattern.
- M. Door and Drawer Fronts: 3/4 inch thick unless shown unless shown otherwise; flush overlay style.
- N. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- O. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate cabinet linings to all interior surfaces of cabinets, drawers and shelving within the cabinets.
- P. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- Q. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- R. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.
- S. Provide a minimum of one (1) adjustable shelf in each cabinet unless more are required by the Drawings.
 - 1. Apply laminate cabinet linings to all interior surfaces of cabinets, drawers and shelving within the cabinets.

- S. All shelving shall have hardwood edge banding.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level in accordance with AWI Section 1700.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose. Refinish cut surfaces or repair damaged finish at cuts.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- G. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
- H. Anchor woodwork to anchors or blocking built-in or directly attached to substrate. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with woodwork, and matching final finish where transparent finish is required.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust moving or operating parts to function smoothly and correctly.
- C. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

3.04 CLEANING

- A. Clean work under provisions of Section 01700.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION

QUARTZ SURFACES

SECTION 06614

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Quartz surface countertops as indicated on the drawings.

1.02 SUBMITTALS

- A. Submit under provision of Section 01300.
- B. Product data for each type of product and process specified and installation.
 - 1. Shop Drawings: Include plans, indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings,
- C. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to site under provisions of Section 01600.

1.04 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 QUARTZ MATERIAL

- A. Material: Material: Solid, non-porous homogeneous material compound of natural minerals and high performance acrylics with natural quartz aggregate; stain resistant, highly resistant to impact damage and with performance properties as published in manufacturer's current product data.
- B. Manufacturers: As indicated on the Drawings
- C. Colors: see drawings.
- D. Thickness: As indicated on the Drawings but in no case less than 2cm..
- E. Joint Adhesive: Provided by top Manufacturer.
- F. Horizontal Setting Adhesive: Silicone Sealant by top Manufacturer.
- G. Vertical Setting Adhesive: Panel Adhesive by Du Pont Co. or Type 1 (ANSI A136.1) solvent based spread mastic waterproof adhesive; water based adhesives are not acceptable.

- H. Warranty: Ten (10) year product warranty to repair or replace

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and supports.

3.02 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
1. Provide product in the largest pieces available.
 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - a. Exposed joints/seams shall not be allowed.
 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 4. Cut and finish component edges with clean, sharp returns.
 5. Rout radii and contours to template.
 6. Anchor securely to base cabinets or other supports.
 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Applied side:
1. Install applied sides using manufacturer's standard color-matched silicone sealant.
 2. Adhere applied sides to countertops using manufacturer's standard color-matched silicone sealant

3.03 CLEANING

- A. Clean work under provisions of Section 01700.

END OF SECTION

LIQUID APPLIED VAPOR/AIR BARRIER MEMBRANE**SECTION 07130****PART 1 - GENERAL****1.01 SECTION INCLUDES:**

- A. Installation of liquid applied vapor/air barrier membrane on all wood, sheathing and CMU surfaces, etc in the exterior wall cavity with scope indicated on drawings, and flashing of openings with sheet or liquid mesh membrane as indicated on drawings and specified herein, consisting of preparation of before mentioned surfaces, sealing of cracks, seams, joints and application of liquid applied vapor/air barrier membrane to provide an uninterrupted air/vapor barrier membrane on all exterior wall cavity surfaces and openings. Treat all sheathing joints with 20 mil thick self adhered membrane
 - 1. **Note: All products associated with metal siding must be rated as “high temperature” with no failure at temperatures up to 180°F. All products shall be non-combustible. Additionally, membrane used at the cladding system (as a Rainscreen installation) must be recommended specifically for that system appropriate for the exposure in the cladding system.**
 - 2. Millage of membranes shall be checked to verify specified thickness every 200 sq.ft. with written report files weekly. Any deficiencies shall be addressed and fixed at time of discovery.
 - 3. Coordinate membrane installation with the continuous board insulation in the wall cavity
- B. All flashing sheets shall be rolled at ends to prevent “fish mouths”, and also sealed at the edges. Millage checks for the thickness of the liquid applied vapor barrier
- C. Installation of flashings at exterior openings shall comply with the following:
 - 1. At the Window head, sill and jamb details provide the tie-in between the wall water barrier/vapor barrier membrane to the window. The method of constructing the seal depends on the window frame assembly.
 - 2. The metal flashing at the head must be incorporated and fully sealed with the exterior wall water barrier/vapor barrier membrane.
 - 3. The metal sill flashing of the window must have a continuous air/water seal with the window and the frame sill must have a water tight seal with water barrier/vapor barrier membrane of the exterior wall.
 - 4. The component “vapor barrier” membrane must be continuous (as it is the last defense against water penetration.)
 - 5. A continuous transition seal between the opening and the wall water/vapor barrier must be achieved. The seal to the window assembly must coincide with the water and air barrier of the opening frame.

1.02 RELATED SECTIONS:

- A. Section 042000 - Masonry
- B. Section 079000 - Joint Sealers
- C. Section 092910 – Exterior wall sheathing

1.03 REFERENCES:

- A. ASTM D 412 Tests for Rubber Properties in Tension.
- B. ASTM E Puncture Resistance.
- C. ASTM E 96(B) Water Vapor Transmission of Materials.
- D. ASTM D 1970 Self-Adhering Polymer Modified Bituminous Sheet Materials.
UL 790 Tests for Fire Resistance of Roof Covering Materials.
- E. ASTM E 283 Tests for Air Leakage through Exterior Assemblies.
- F. ASTM E 331 Tests for Water Penetration of Exterior Assemblies.
- G. ASTM E 2178 Test for Air Permeance Rating.
- H. ASTM D 1187 Test for Asphalt-Base Emulsions
- I. ASTM D 2939 Test for Emulsified Bitumens.

1.04 SYSTEM DESCRIPTION:

- A. Product provided by this Section is a self-adhesive liquid applied membrane of not less than 40 dry mils thickness, consisting of a water-based asphalt emulsion modified with a blend of synthetic rubbers and additives which cures to form a flexible, monolithic Vapor/Air Barrier.

1.05 SUBMITTALS:

- A. General: Submit in accordance with Section 01300.
- B. Product Data: Submit manufacturer's product literature, installation instructions and standard details.
- C. Subcontractor approval by manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
- D. Warranty: Submit a sample warranty identifying the terms and conditions stated herein.

1.06 QUALITY ASSURANCE:

- A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.
- B. Ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).
- C. Pre-Application Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

- D. Product Components: Vapor/Air components shall be sourced from one manufacturer, including sheet membrane, sealants, primers, adhesives and mastics.
- E. Mock-Ups: Apply to field-constructed mock-up assemblies illustrating material interfaces and seals. Use the manufacturer's application instructions. Keep mock-ups available for inspection throughout the project.

1.07 WARRANTY:

- A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials, including materials, installation and labor, including costs to access and reinstall. for a period of 5 years from acceptance date of project.

1.08 DELIVERIES, STORAGE AND HANDLING:

- A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with the following information.
 - 1. Name of material.
 - 2. Manufacturer's stock number and date of manufacture. Materials in protected and well ventilated area.

1.09 PROJECT CONDITIONS:

- A. Do not apply membrane if temperature is less than 40 degrees F. or to a damp, frosty or contaminated surface.
- B. Coordinate vapor/air barrier application with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation.
- C. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.
- D. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs.
- E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS:

2.01 MANUFACTURERS:

- A. Specification is based on "Fire Resist Bariteck NP" as manufactured by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane; Wylie, Texas 75098, Phone: (800) 527-7092 Fax: (972) 442-0076 or "Perm-A-Barrier NPL 10" by W.R. Grace & Co. or "Air Bloc 16MR" by Henry **All products shall be non-combustible and non-permeable**

2.02 PRODUCTS:

- A. Self-Adhesive liquid applied Vapor/Air Barrier Membrane: Shall be single coat application of 40 dry mil liquid thick application of rubberized asphalt rubberized asphalt, and shall meet or exceed the following requirements:
 - 1. Resilience: 98% ASTM D-3407
 - 2. Ultimate Elongation: 1300% minimum, ASTM D-41
 - 3. Perm Rating: 0.03 ASTM E-96
 - 4. Transmission: 0.01 gm/sq.ft ASTM E-96
 - 5. Fire Propagation Characteristics: Passes NFPA 285 testing as aprt of an approved wall assembly

2.03 ACCESSORY PRODUCTS:

- A. Surface Primer: Shall be CCW-702 Solvent-Based Primer , CCW-AWP Water-Based primer or CCW-CAV-Grip.
- B. Detail Membrane: CCW-705 TWF (Carlisle) or Grace V40 tape/Perm-A-Barrier Wall Flashing.
- C. Mastic: Shall be CCW-704 Mastic.
- D. Sealants: Shall be CCW-703 Vertical Grade Liquiseal membrane, PT-304 one component or CCW-201 two component Polyurethane Sealant.

PART 3 - EXECUTION:

3.01 INSPECTION:

- A. Before any barrier application is started the applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.
- B. Condition of Gypsum Based Sheathing Surfaces:
 - 1. The sheathing surfaces shall be of sound structural grade and shall have a smooth finish, free of voids, ridges, fins or entrained air holes.
 - 2. Sheathing shall be fastened with non-corroding screws.
 - 3. Sheathing shall be butted flush with adjoining panels.
 - 4. Irregularities shall be sanded or filled as required to achieve flush surfaces.
 - 5. All adjacent metal flashing shall be galvanized or non-ferrous metal, tight screwed or nailed.
 - 6. Surfaces at joints shall be on the same plane and taped.
- C. Condition of Wood Surfaces:
 - 1. The wood surfaces shall be of sound structural grade and shall have a smooth finish, free of holes, splits, or entrained air holes.
 - 2. Wood shall be fastened with non-corroding screws, twist shank nails or be approved by the Carlisle representative.
 - 3. Wood shall be butted flush with adjoining panels.
 - 4. Irregularities shall be sanded of filled as required to achieve flush surfaces.

5. All adjacent metal flashing shall be galvanized or non-ferrous metal, tight screwed or nailed.
6. Surfaces at joints shall be on the same plane.

3.02 SURFACE PREPARATION:

- A. The wall surface must be thoroughly clean, dry and free from any surface contaminants or cleaning residue that may harmfully affect the adhesion of the membrane.
- B. All cracks over 1/16" in width should be filled with material compatible to the substrate. Most wood applications can be filled with exterior grade urethane caulking.
- C. All crack filler compound to thoroughly cure prior to proceeding.
- D. Trim or detail all door, window, and penetrations using Carlisle's standard details.
- E. Brick ledge flashing should be in-place prior to application of Vapor/Air Barrier.

3.03 APPLICATION:

- A. Clean surfaces to remove residual dust before priming and install membrane and joint treatments in strict accordance with membrane manufacturers printed instruction.
- B. Detail – At all joints, seams, penetrations apply either 30 mil coat of Bariteck containing DCH reinforcing fabric, or apply a strip of CCW-705 membrane to completely cover with generous overlap on a primed surface to maintain the integrity of the vapor barrier.
- C. Apply B Bariteck from base of wall working up to allow water to drain over the applied area. Install at 31 sq ft per gallon.
- D. Terminations: Apply the membrane on to the edge of brick ledge flashing, door and window flashing tapes. Extend the membrane up above the interior living space or on to the roof vapor/air barrier.
- E. Protection: Vapor/Air Sheet Membranes are not designed for permanent exposure and should be covered as soon as construction scheduling allows.

END OF SECTION

CRYSTALLINE WATERPROOFING**SECTION 07145****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Elevator pit waterproofing; all horizontal and vertical surfaces, and treatment of joints and penetrations. Provide slurry coat system.
- B. Provide slurry coat system on CMU walls where indicated on the drawings.
- C. Permeable grout tubes injected with sealing material at all intersections of horizontal and vertical construction. See attached Data Sheet for the grout tube installation, as a part of this Section 07145.

1.02 RELATED SECTIONS

- A. Division 3 - Concrete Work.
- B. Division 14 - Elevators.

1.03 REFERENCES

- A. Applicable standards; standards of the following as referenced herein:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. Army Corps of Engineers (CRD).

1.04 SYSTEM DESCRIPTION

- A. Crystalline Waterproofing: Mix of Portland cement, fine treated silica sand and active proprietary chemicals which when mixed with water and applied as a cementitious coating, causes a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process shall cause concrete to become permanently sealed against the penetration of water or liquids from any direction.

1.05 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Product Data: Submit product data including installation methods for surface applications, treatment of penetrations and junctures, etc. for each type of product required, to demonstrate products comply with Contract Documents.
- C. Test Reports: Submit and obtain acceptance of independent laboratory test reports of tests specified herein, prior to application of cementitious crystalline waterproofing material.

- D. **Manufacturer's Certification:** Provide a copy of manufacturer's representative's report certifying that surfaces to which waterproofing is to be applied are in an acceptable condition to receive same, that materials to be installed comply with specified requirements, and that applicator has the experience to install the materials in accord with manufacturer's product data.

1.06 DELIVERY AND STORAGE

- A. Waterproofing materials shall be delivered to the project site in original sealed containers with manufacturer's name and brand clearly identified, shall be stored in dry locations with adequate ventilation, and shall be handled in a manner to prevent damage or contamination.

1.07 QUALITY ASSURANCE

- A. Provide products of a manufacturer with no less than 10 years experience in manufacturing the principal materials for the required work.
- B. **Applicator:** Waterproofing applicator shall be a firm experienced in the installation of cementitious crystalline waterproofing as demonstrated by previous successful installation. Waterproofing applicator shall be acceptable to the manufacturer and such acceptance shall be indicated in writing.

- 1. The following contractors are approved to install the grout tube system:

Associated Waterproofing :
Martin Mapp # 225-389-9612

Thrasher waterproofing:
Zeb Thrasher # 985-845-8353

- C. **Pre-installation Conference:** Schedule a meeting, before start of construction of surfaces to receive waterproofing, with waterproofing applicator, applicators of work adjacent to or which penetrates waterproofing, waterproofing manufacturer's technical representative, Architect and Owner's representative to review procedures for substrate preparation and waterproofing application.
 - 1. Review Contract Document requirements for waterproofing and waterproofing manufacturer's product data including application instructions.
 - 2. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with waterproofing work.

1.08 PROJECT CONDITIONS

- A. Comply with manufacturer's product data regarding condition of substrate to receive waterproofing, weather conditions before and during installation, and protection of the installed waterproofing system including work which will penetrate waterproofing.

1.09 WARRANTY

- A. Applicator, individually and separate from performance bonds, shall warrant his work from the Date of Substantial Completion, covering the surfaces treated, and binding him to repair,

at his expense, any and all leaks through the surfaces treated which are not due to structural weaknesses or other causes beyond his control, such as fire, earthquake, tornado, and hurricanes, for a period of five (5) years after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable products for slurry coat application: "Xypex Concrete Waterproofing by Crystallization" by Xypex Chemical Corporation and "Penetron" by Penetron Corporation or HEY'DI K-11.
- B. Provide products manufactured or approved by prime waterproofing manufacturer.
- C. Gout Tube Products: equal to "INJECTO" systems as available from De Neef Construction Chemicals, Inc. and distributed by TCS, Kenner, LA (504) 466-4564. To be considered equal, an alternative product shall:
 - 1. Be constructed to resist the pressures of freshly placed concrete.
 - 2. Have a filter layer to prevent the entry of cement particles into the tube, yet allow the easy passage of the sealing material during injection over the total length of the tube.
 - 3. Have protection for the filter layer to resist the abrasive effects of the concrete aggregates.
 - 4. Be less than 3/4 inch overall diameter.
- D. Tube Sealing Material: Hydrophobic polymer of the isocyanate type which is installed by injection. The uncured polyurethane grout shall have a viscosity of 600 - 1000 cps (at 70 F) and be 100% solids, Hydro Active Flex LV of De Neef Construction Chemicals, Inc.
 - 1. When the sealing material is mixed with approx. 10% water, the sealing material shall expand and cure to a closed cell foam with a tensile strength of 30 psi and 250% elongation (ASTM-3574).
 - 2. The sealing material shall have the ability to react in moving water and the viscosity shall remain the same until gelation occurs.
 - 3. The cured sealing material shall be resistant to most organic chemicals, mild acids, alkali, micro-organisms and be essentially non-toxic

2.02 PERFORMANCE CRITERIA

A. Slurry Coat System

- 1. Perform independent testing according to CRD C48-73 Permeability of Concrete under the following conditions:
 - a. Concrete samples shall be 6 inches (150 mm) in diameter and no thicker than 2 inches (50 mm).
 - b. Coatings shall be a maximum thickness of 0.05 inches (1 mm) per coat with up to 2 coats permitted.
 - c. Concrete samples shall have a design strength of 2000 psi or less. No admixtures will be permitted.

- d. A minimum of four samples shall be tested; 2 treated and 2 untreated. Untreated samples shall exhibit leakage at 10 psi or less.
- e. Test samples to a pressure of 175 psi (405 foot head of water). Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage whatsoever.

2.03 MIXES

A. General:

- 1. Mix waterproofing material by volume with clean water, which is free from salt and deleterious materials. Mix materials in quantities which can be applied within 20 to 30 minutes from the time of mixing. As mixture thickens, stir frequently, but do not add additional water.
- 2. Do not mix bonding agents or admixtures, with crystalline waterproofing materials.

B. Brush application mix:

- 1. Measure dry powder and place in mixing container. Measure water and mix into powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer which will ensure mixing and is acceptable to manufacturer.
- 2. Mixing proportions shall be as follows:

<u>Coverage</u>	<u>Proportions (by Vol.)</u>
1.5 lbs. per sq. yd	5 powder to 2 water
2.0 lbs. per sq. yd.	3 powder to 1 water

C. Spray application mix:

- 1. Mixing shall be same as specified for brush application, except that mix shall be thinner. Use the following proportions only as a guide. Adjust proportions in order to match type of equipment and pressures used.
- 2. Mixing proportions shall be as follows:

<u>Coverage</u>	<u>Proportions (by Vol.)</u>
1.5 lbs. per sq. yd	5 powder to 3 water

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to start of waterproofing installation, arrange a visit to project site by waterproofing material manufacturer's representative. Representative shall inspect and certify that surfaces to which waterproofing is to be applied are in acceptable condition.
- B. Verify that surfaces are sound and clean.

- C. Verify that form release agents, methods, and materials used to cure concrete surfaces are compatible with waterproofing materials.

3.02 PREPARATION AND INSTALLATION

- A. General: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints, and cracks. Repair these defects in accordance with manufacturer's product data and as follows:
 - 1. Form tie holes, faulty construction joints and cracks: Chip defective areas in a "U" shaped slot 3/4 inch to 1 inch wide and a minimum of 1 inch deep. Clean slot of debris and dust. Soak with water and remove surface water then fill cavity with Dry-Pac. Compress into cavity using pneumatic packer or block and hammer.
 - 2. Rock pockets, honeycombing or other defective concrete: Rout out defective areas to sound concrete. Remove loose materials and saturate with water. After slurry has set, but while it is still "green", fill cavity to surface with non-shrink grout.
- B. Construction joints:
 - 1. Install injectable grout tube in accordance with manufacturer's instructions. See subsection 3.04.
- C. Concrete finish:
 - 1. Concrete surfaces shall have an open capillary system to provide tooth and suction and shall be clean; free from scale, excess form oil, laitance, curing compounds and foreign matter. Smooth surfaces caused by steel forms and surfaces covered with excess form oil or other contaminants shall be lightly sandblasted or waterblasted to provide a clean absorbent surface equivalent to ICRI CSP 3.
 - 2. Vertical surfaces may have a sacked finish.
 - 3. On horizontal surfaces which do not require a trowel finish, a broom finish shall be provided. Do not apply waterproofing material to this surface if concrete is less than 20 hours old.
 - 4. Apply waterproofing material to "green" concrete as soon as possible after forms have been stripped, or to existing concrete which has been saturated with water. Moisten surfaces to be treated prior to application, as required to insure migration of crystalline chemicals into capillary voids in concrete. Remove free water prior to treatment with waterproofing material.
- D. Surface Application: After repair, patching and sealing strip placement has been completed in accord with manufacturer's product data and as specified herein, treat concrete surfaces with waterproofing material slurry applied at rates and locations indicated on Drawings and in accord with manufacturer's product data.
- E. Brushing: Use a semi-stiff bristle brush or broom to work slurry into concrete surface, filling hairline cracks and surface pores.
- F. Spraying: Hold spray nozzle close enough to ensure that slurry is forced into surface pores, and hairline cracks.

- G. First Coat: Apply at a rate of 1.5 lbs. per Sq. Yd
- H. Second Coat: Apply at a rate of 1.5 lbs. per Sq. Yd while first coat is still "green", but after it has reached an initial set. Lightly pre-water when rapid drying conditions occur.

3.03 INSTALLATION OF GROUT TUBES AND SEALING MATERIAL

- A. Grout tubes shall be fastened to clean concrete surface every 12 inches (see drawing for location in construction joint). The Plastic ends will be bent so that they will protrude through or under the forms. Install tube in strict accordance with tube manufacturer's printed instructions.
- B. Each end of the grout tube shall cross the next one so that there will be no default in the injected zone.
- C. After the concrete has cured the grout tubes shall be injected with the sealing material to fill the construction joint and any honeycombs with the sealing material.
- D. Prior to injection of the sealing material, water will be injected into one end in order to provide water for the reaction process and to verify continuity between ends.
- E. Water shall be injected into one end until it begins to flow from other end of grout tube. If an excessive amount of water needs to be injected or a blockage is encountered the location needs to be marked. This marking will influence the injection procedure
- F. Start the injection of the sealing material at one end of the grout tube (pressure of approx. 200 psi). As soon as sealing material appears at other end, close this other end and increase pump pressure (to approx. 250 psi). Stop injection when sealing material percolate out of joint or a substantial back-pressure is built.
- G. Patch injection ends with high strength cementitious mortar so not noticeable

3.05 CURING

- A. Slurry Coat:
 - 1. Begin curing as soon as waterproofing materials have set up sufficiently so as not to be damaged by a fine spray. Fog-spray treated surfaces three times a day for a two day period, or cover treated surfaces with damp burlap for the prescribed period.
 - a. In warm climates, more than 3 sprayings per day may be necessary to prevent excessive drying of coating.
 - b. Do not lay plastic sheeting directly on waterproofing coating as air contact is required for proper curing.
 - c. For structures holding hot or corrosive liquids, cure waterproofing for 3 days and allow to set for 18 days.
 - d. If there is poor air circulation in treated areas, provide fans or blown air to aid in curing of waterproofing.
 - 2. Horizontal surfaces: Begin curing as soon as final set has occurred but before surface starts to dry. Conventional moist procedures such as water spray, and wet burlap may be used. Cure for a minimum of 48 hours.
 - 3. In hot, dry, sunny conditions, consult manufacturer's product data.

4. If moist curing is not possible, a chemical curing agent manufactured for or compatible with each approved waterproofing material shall be available for the work. Chemical agent shall have at least 2 years of successful field use to be eligible for acceptance.
5. Protect cured surfaces from damage to wind, sun, rain and temperatures below 36 degrees F. for a period of not less than 48 hours after application. If plastic sheeting is used as protection, it shall be raised off waterproofing coating to allow air circulation.

3.06 PROTECTION AND CLEANING

- A. Protect completed coating from damage after application for balance of construction period.
- B. Do not permit traffic on unprotected coating.
- C. Clean spillage and soilage from adjacent surfaces, using cleaning agents and procedures recommended by manufacturer of surface.

END OF SECTION



INJECTO® Tube Groutable Hose Waterstop System

Product Description

INJECTO is an injectable waterstop system that provides a conduit for the placement of DeNeef chemical grouts. The 1/2" (12mm) permeable tube is installed before the concrete pour, but not injected until after the shrinkage associated with the curing concrete process is complete. This allows the cracks to open fully before permanently sealing the interfaces and voids within construction joints, pipe penetrations, slurry walls, and slab connections with chemical grout.



Figure 1. Injecto Tube Kit.

Product Advantages

- Fast, simple installation
- No special tools required
- Low pressure injection
- Permanent seal after injection
- Injectable anytime after concrete cure
- INJECTO** System Warranty

Applications

- Sealing cold and construction joints
- Sealing pipe penetrations
- Sealing joints between slurry walls and slabs

INJECTO Tube may be used with the following chemical grouts:

- Flex SLV PRe with 1% Flex Cat PRe
- Flex LV PRe with 1% Flex Cat PRe
- Superflex AR Acrylate prepared according to data sheet.

Properties

Typical Properties	
Outside Diameter	1/2 inch
Inside Diameter	5/16 inch
Length	Maximum 25 ft.
Weight	4.5 lbs per 25 ft.
Operating temperature	Up to 158°F
Tensile strength steel wire	Approx. 261,000 psi
Diameter filter pores	35 microns

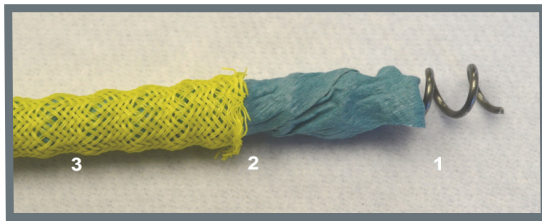
Note: The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown above may result.

Packaging & Handling

INJECTO Tube is supplied in 100 ft. kits to allow the system to be cut to length on site. The maximum recommended cut length of **INJECTO Tube** to be installed between packers is 25 ft. (see figure #1)
Yellow INJECTO Tube: 100 ft.
Clear PVC Packer Tubing : 18 ft.
Blue trumpets: 12 pieces.
Anchoring clips: 100 pieces.
1 Pallet = 40x100 ft. kits = 4000 ft.

Unlimited shelf life when stored in a dry place.

Injecto Tube Construction



A high strength spiral wire coil (1) prevents collapse during concrete placement, while the non-woven filter membrane (2) prevents the tube from being clogged with concrete particles. A bright yellow reinforced mesh sleeve (3) protects the tube and allows for easy inspection before the pour. Wherever old to new concrete surfaces join, the INJECTO Tube system can be easily installed.

Installation Guidelines

The yellow INJECTO Tube is installed onto the hardened concrete during formwork installation. In case of rough surfaces, any gap between INJECTO Tube and the surface should be filled with SWELLSEAL® WA.

The yellow INJECTO Tube is cut to the required length on the job site. (recommended length 25 ft. or less). The cut ends are smoothed with a twist; then the blue trumpets are installed over the yellow INJECTO Tube and screwed down to the stop mark inside the trumpet. (Figure 3)

The yellow INJECTO Tube is attached to the concrete with the anchoring clips between the inner and outer reinforcing bars. Attach the anchoring clips to the concrete every 12 inches with concrete anchors or nails applied with a powder actuated system (see figures 5, 6 & 7)

The blue trumpets provide a connection between the yellow INJECTO Tube and the clear packer tubing. Trumpets on adjacent runs should be installed with the wide ends of the trumpets (where the yellow INJECTO Tube is attached) in line with each other and the two trumpets separated by 2-3 inches (see figure 8). This will help avoid cross contamination of the yellow INJECTO Tubes during the grouting operation.

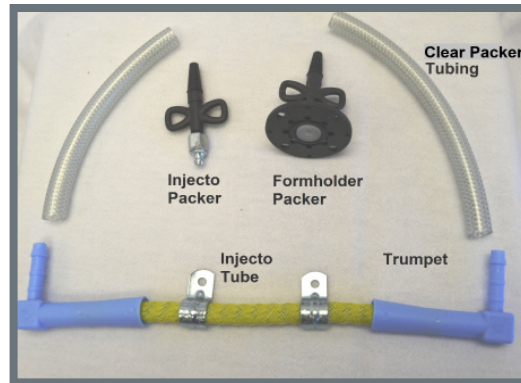


Figure 3. Injecto Tube shown with blue trumpets



Figure 4. Position of trumpets.



Figure 5. Anchoring clips on Injecto.

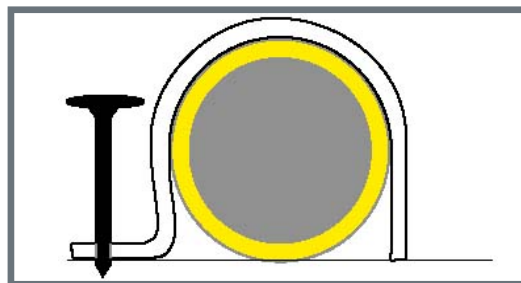


Figure 6. Nailing anchor clips

Always terminate the yellow INJECTO Tube into a trumpet and allow for a minimum of 2-1/2" of concrete cover. **Do not run the yellow INJECTO Tube outside the formwork.**

Attach the clear packer tubing over the serrated end of the trumpets. Then cut the appropriate length of packer tubing as required to reach a formholder packer or to extend outside the formwork. The clear packer tubing should be secured with tie wire to the rebar to prevent movement during the pour.

The formholder packers can be either nailed to wooden formwork or attached to the rebar with steel tie wire if metal forms are used. If formholder packers are used, attach the clear packer tubing directly to them. If the clear packer tubing is being run outside the formwork, protect the open ends with a plastic cap or tape and take measures to protect them from damage during formwork installation and stripping.

The INJECTO Tube System is ideal for unique and problem details such as pipe penetrations and attaching to conventional PVC waterstops that may encounter very high head pressures (see figures 9 and 10).

CAUTIONS:

1. The yellow INJECTO Tube must be installed in direct contact with the joint over its full length, to allow proper and complete distribution of the injection resin. If the concrete is not smooth enough to allow full contact, use SWELLSEAL® WA to create a smooth surface. Press INJECTO into the SWELLSEAL WA.
2. Do not cross the yellow INJECTO Tubes. Yellow should never touch yellow or cross contamination could occur during the grouting operation.
3. The ends and beginnings of yellow INJECTO Tube lengths should be done as in figures 4 and 8 to prevent cross contamination during the resin injection process.

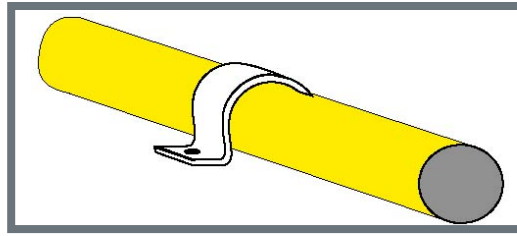


Figure 7. Placement of anchor clips

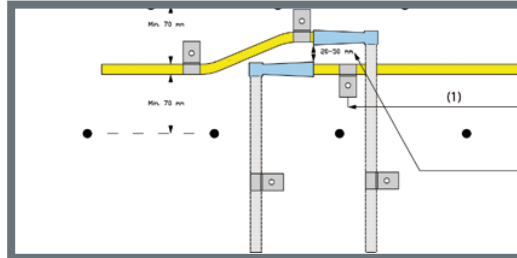


Figure 8. End and beginning of Injecto Tube lengths.

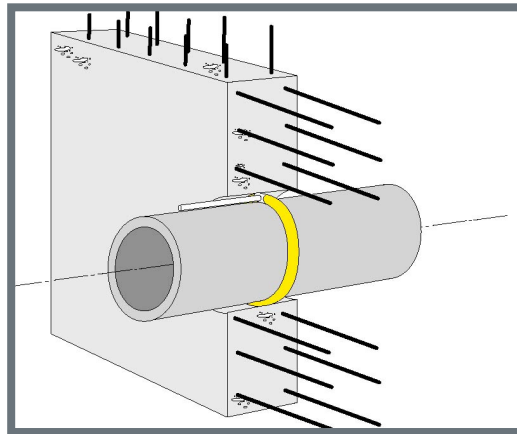


Figure 9. Pipe Sealing

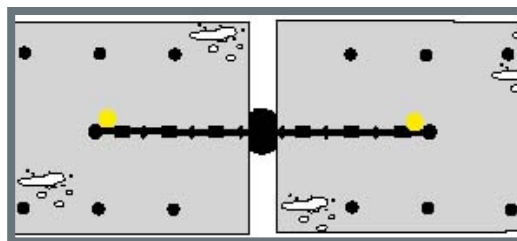


Figure 10. PVC Waterstop

4. Concrete coverage must be a minimum of 2 ½" on all sides. After concrete has cured for the recommended 28 days, any water infiltrating into the joint will be collected by the system and appear through the clear packer tubing. The tubing should either protrude out of the concrete at easily accessible places or be connected to a formholder packer.

The INJECTO Tube system is designed to provide a delivery system for waterproofing resins, which are injected into the structure in accordance with the instructions found in the selected injection resins technical data sheets. Consult with the DeNeef Technical Department for assistance in selecting the appropriate sealing resin for each condition.

Health and Safety

Always use protective clothing, gloves and goggles consistent with OSHA regulations during use. Avoid eye and skin contact. Do not ingest. Refer to Safety Data Sheet (SDS) for detailed safety precautions.

In the event of an EMERGENCY call:

CHEMTREC 800-424-9300.

Limitations

INJECTO Tube waterstop system must be installed by an Approved DeNeef **INJECTO** Applicator in accordance with the **INJECTO** Manual for Warranty to be effective. Concrete cover must be a minimum of 2 ½" on all sides.

Revised 04/2013

www.deneef.com

Technical Service 1-800-732-0166

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.—Conn., 62 Whittemore Avenue, Cambridge, MA 02140.

In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

This product may be covered by patents or patents pending.

DN-037

Printed in U.S.A.

Copyright 2011. W. R. Grace & Co.—Conn.

5/13 FA/DSG/2.6M

GRACE

BUILDING INSULATION**SECTION 07210****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Labor, materials, tools, and equipment to perform all operations necessary for thermal insulation work indicated or specified.
- B. The applications of thermal insulation specified in this section include Rigid board CI insulation (R-5.7 at cavity of masonry and metal panel exterior walls and R-5 at exterior CMU wall; blanket insulation (R-19 in wall and soffit areas as follows:
 - 1. Formaldehyde-free blanket type building insulation in stud walls.
 - 2. Board type stone wool cavity continuous wall insulation (or optional polyisocyanurate insulation specified herein) installed with self-adhered galvanized plate and impaling pins 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square and watertight washers of spacing required to hold insulation in place over applied on fluid applied membrane specified in Section 071300.
Note: Metal panel supports must be installed before application of cavity installation
 - 3. R-values are indicated on the Drawings.
- C. Safing insulation is specified in Section 07270 – Firestopping.

1.02 QUALITY ASSURANCE

- A. Thermal Resistance Values: Provide, if required, adjusted thicknesses of insulation (based on the insulation's thermal conductivity) to maintain the required thermal resistance. R-values are based on requirements of SPRR 257-55 of the U.S. Department of Commerce.
- B. Fire and Insurance Ratings: Comply with the fire resistance, flammability and insurance ratings indicated and comply with code interpretations by governing authorities.
- C. Provide insulation with a flame spread rating of less than 25 and a smoke development rating of 50 or less.
- D. Single-Source Responsibility for Insulation Products: Obtain each type of insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of work.

1.03 SUBMITTALS

- A. Manufacturer's Data: Submit 2 copies of manufacturer's specifications and installation instructions for each type of insulation required. Include data substantiating that the materials comply with specified requirements.
 - 1. Verify in writing compatibility with dampproofing specified in Section 07160.
- B. Warranty: Warranty that board insulation will retain 90% of its original R-value for 15 years.

1.04 PRODUCT HANDLING

- A. Protection from Deterioration: Do not allow insulation materials to become wet, soiled or covered with ice. Comply with manufacturer's recommendations for handling, storage and protection during installation.

1.05 JOB CONDITIONS

- A. Examination of Substrate: The Installer must examine the substrate and the conditions under which the insulation work is to be performed and notify the Contractor in writing of any unsatisfactory conditions. Do not proceed with the insulation work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Formaldehyde-free Blanket Insulation: Inorganic glass fibers formed with acrylic-thermo setting resins into flexible resilient blankets or semi-rigid resilient boards; complying with ASTM C665, manufacturer's standard lengths and widths as required to coordinate with the spaces to be insulated.
 - 1. Provide unfaced, formaldehyde-free insulation complying with ASTM C665, Type 1, for friction-fitting in walls.
 - 2. Provide edge conditions required for construction indicated on the Drawings and spindle-type anchors to hold insulation permanently in place as indicated below.
 - 3. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation, or thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:
 - a. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches (2.67 mm) in diameter, length to suit depth of insulation indicated and washer of minimum 1 ½ " diameter.
- B. Cavity Board Insulation: semi-rigid non-combustible stone wool insulation board with a black mineral fleece facing.
 - 1. Approved : ROCKWOOL Cavityrock® Exterior Insulation for Cavity Wall and Rainscreen Applications
 - 2. Thermal Insulation for Buildings - Type 1VB Compliant ASTM C612
 - 3. Fire Flame spread index = 0;
 - 4. Smoke developed index = 0 Flame spread index = 0;
 - 5. Density Dual Density - 6.2 lbs/ft³ (100 kg/m³) outer layer and 3.8 lbs/ft³ (61 kg/m³) inner layer ASTM C303
 - 6. Dimensional Stability Linear Shrinkage = 0.7% @ 1200°F (650°C) ASTM C356
 - 7. Corrosion Resistance Stress Corrosion Cracking Tendency of Austenitic Stainless Steel - Passed Corrosion of Steel - Passed ASTM C795 ASTM C665
 - 8. Thermal Resistance R-Value / inch @ 75 degrees of 4.3 hr. ASTM C518 (C177)
 - 9. Reaction to Moisture Moisture Sorption - 0.03% by volume
 - 10. Water Vapor Transmission, Desiccant Method - 1555ng/Pa.s.m2 (27 perm) – Passed ASTM E96
 - 11. Determination of Fungi Resistance - Passed ASTM C1338.

12. At Contractor's option, provide polyisocyanurate cavity board insulation as follows: Glass-fiber-reinforced closed cell polyisocyanurate foam core sheathing bonded to, inorganic polymer coated glass waterproof fiber mat facers on each side complying with ASTM C1289 Type 1, Class 2, R value-6/inch equal to "Durasheath" by Rmax.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's instructions for the particular conditions 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, and fill voids with insulation.
- C. Apply a single layer of insulation of the required thickness, unless otherwise shown or required to make up the total thickness.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Where insulation is not enclosed by interior finish, i.e. above ceilings fasten insulation spindle anchors to substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Place minimum of two (2) anchors between each stud.
 4. After adhesive has dried, install insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers to tips of spindles, taking care not to rupture the insulation.
- E. Install cavity wall board insulation horizontally beginning at the bottom of the inner wythe and secure to inner wythe with. Install subsequent courses of insulation by applying boards directly above the underlying courses with staggered joints. Boards should be tightly butted. Keep insulation above the level of the outer wythe during installation to enable adjustment of insulation. Seal around cut-outs with construction adhesive.
 1. On insulation, install with self-adhered galvanized plate and impaling pins 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square and watertight washers of spacing required to hold insulation in place, as recommended by manufacturer. Press courses of insulation between wall support furring and other confining obstructions in the cavity, with edges butted tightly both ways. Press units firmly against inside wythe or other construction as shown.
 2. Install in accordance with manufacture guidelines,.
- F. Sound Absorptive Semi-Rigid Board Application: Insulation shall be adhered at perimeter by a fire retardant adhesive. In addition, insulation shall be secured to substrate using non-ferrous mechanical fasteners. Fasteners shall be 12 gauge perforated base with welded pins and speed clips. Apply fasteners 12" on center maximum with insulation hanger adhesive. Peel and press type fasteners are not acceptable.

1. The pins shall be cut off flush, plastic washers shall be used and installation made so that no gaps or loose edges occur in the insulation. Apply a brush coat of hanger adhesive to washers, extending onto insulation surface a minimum of 2". Top pieces shall be supported by the side pieces. All transverse and longitudinal abutting edges of insulation shall be sealed and lapped 3" with a heavy coat of adhesive.

3.02 PROTECTION

- A. General: Protect installed insulation from harmful weather exposures and from possible damage by completing the enclosing construction as soon as possible or by temporary enclosure.

END OF SECTION

FIRESTOPPING**SECTION 07270****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Firestopping materials and accessories for all penetrations through existing and new fire or smoke rated construction with ratings indicated on the Drawings. Maintain fire ratings of construction being penetrated to include, but not limited to the following:
 - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Wall openings at heads of partitions between walls and overhead construction.
 - 4. All penetrations for data/communication cabling shall be firestopped with "putty" type firestopping herein specified to accommodate future removal and reuse.

1.02 RELATED SECTIONS

- A. Division 16: Electrical work requiring firestopping.

1.03 REFERENCES

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E814 - Standard Test Method of Fire Tests of Through-Penetration Firestops.
- C. UL 1479 Fire Test of Through - Penetration Firestops.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.

2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 4. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal if insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke developed values of less than 250 as determined per ASTM E 84.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data on product characteristics, performance and limitation criteria for each product required.
- C. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- D. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency, i.e. U.L. evidencing compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
- E. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

- F. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the work of this Section approved in writing by the manufacturer of the firestopping products. All firestop applications shall be performed by a one-specialty contractor that is trained and licensed specifically in this discipline. Said contractor's personnel shall have received specific training and certification or approval from the proposed respective firestop manufacturer and shall have a minimum of two years experience installing firestop systems of the type herein specified.
- C. Firestop System: Through Penetration Firestop Systems shall be designed to prevent the spread of fire, gases and smoke through openings in fire rated assemblies for a specified period of time. Incorporating the use of specific products installed in a specific manner, they shall only be installed in configurations for which they have been specifically tested and listed by Underwriters Laboratories (UL) per ASTM E 814 or UL 1479.
- D. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspection agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical of those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference through-penetration firestop system designations listed by UL in their "Fire Resistance Directory", by Warnock Hersey, or by another qualified testing and inspecting agency.
- E. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - 1. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - 2. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

- F. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- G. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.
- C. Provide ventilation in areas to receive solvent cured materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 3M Fire Protection Products
- B. Bio Fireshield, Inc.
- C. Dow Corning Corp.
- D. Hilti Construction Chemicals, Inc.
- E. International Protective Coatings Corp.
- F. The RectorSeal Corp.
- G. Tremco, Inc.
- H. Substitutions: Under provisions of Section 01600.

2.02 MATERIALS - GENERAL

- A. Through-Penetration Firestopping System: Provide systems listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems must be asbestos-free. Mortar systems must be Warnock Hersey approved.

1. Additional requirements: Withstand the passage of cold smoke either as inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.
 2. Acceptable Manufacturers and Products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved or Mortar systems approved by Warnock Hersey.
 3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.
- B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- C. Firestopping Material: Single component elastomeric foam compound, intumescent sealant, formulated compound mixed with incombustible non-asbestos fibers or mineral fiber stuffing insulation in combination with and encapsulated by the aforementioned products; passing ASTM E814 (UL 1479) Standard Method of Fire Tests for Through Penetration Fire Stops with basic rating criteria as follows:
1. F Rating: No visible passage of flame or flaming on any element during rating period.
 2. T Rating: Temperature rise of any thermocouple limited to 181°C (325°F) above ambient on non-fire side during rating period.
 3. Hose stream applied with no projection of water through fire stop.
- D. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- E. Accessories: Provide components for each firestopping system that are needed to install fill materials and comply with "System Performance Requirements: article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.03 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

- B. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- C. Intumescent Putty/Compound: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- E. Mortar: Prepackage dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.
- F. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- G. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- I. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer based sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- J. Products: Subject to compliance with requirements and actual job conditions, products and combination of products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Endothermic, Latex Sealant: As follows:
 - a. Fyre-Shield, Tremco, Inc.
 - 2. Endothermic, Latex Compounds: As follows:
 - a. Flame-Safe FS500/600 Series, International Protective Coatings Corp.
 - b. Flame-Safe FS900/FST900 Series, International Protective Coatings Corp.
 - 3. Intumescent Latex Sealant: As follows:
 - a. Metacaulk 950, The RectorSeal Corporation.
 - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.

- c. Firestop Sealant FS605 and FS611A, Hilti Construction Chemicals, Inc.
- 4. Intumescent Putty/Compound: As follows:
 - a. Pensil 500 Intumescent Putty, General Electric Co.
 - b. Flame-Safe FSP1000 Putty, International Protective Coatings Corp.
 - c. Fire Barrier MPS-2 Moldable Putty, 3M Fire Protection Products.
 - d. Trowelable Firestop Compound FS635, Hilti Construction Chemicals, Inc.
 - e. Biostop Fire Rated Putty, The RectorSeal Corp.
 - f. Biostop Fire Rated Putty Pods, The RectorSeal Corp.
- 5. Intumescent Wrap Strips: As follows:
 - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
 - b. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.
 - c. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
 - d. Biostop Wrap Strip by The RectorSeal Corp.
- 6. Mortar: As follows:
 - a. Bio K-10, Bio K-2 Mortar by The RectorSeal Corp.
 - b. 3M Fire Barrier Mortar.
 - c. K-2 Firestop Mortar, Bio Fireshield, Inc.
 - d. Novaskit K-10 Firestop Mortar, Bio Fireshield, Inc.
 - e. KBS-Mortar Seal, International Protective Coatings Corp.
- 7. Pillows/Bags: As follows:
 - a. Firestop Pillows, Bio Fireshield, Inc.
 - b. KBS Sealbags, International Protective Coatings Corp.
- 8. Silicone Foams: As follows:
 - a. Dow Corning Fire Stop Foam 2001, Dow Corning Corp.
 - b. Pensil 200 Foam, General Electric Co.
- 9. Sealants: As follows:
 - a. Dow Corning firestop Sealant 200, Dow Corning Corp.
 - b. Dow Corning Firestop Sealant SL 2003, Dow Corning Corp.
 - c. Pensil 100 Firestop Sealant, Hilti Construction Chemicals, Inc.
 - d. Metacaulk 835, The RectorSeal Corporation.
 - e. Metacaulk 880, The RectorSeal Corporation
 - f. Fyre-Sil, Tremco Inc.
 - g. Fyre-Sil S/L, Tremco Inc.
 - h. Biostop 500+ by The RectorSeal Corp.
 - i. Biotherm 100, Biotherm 200 by The RectorSeal Corp.
 - j. Biostop 700 by The RectorSeal Corp.
 - k. CP 25WB+ Caulk by 3M.
- 10. Solvent-Release-Curing Intumescent Sealants: As follows:

- a. Biostop 500 Intumescent Firestop Caulk, BioFireShield, Inc.
- b. Fire Barrier CP 25N/S Caulk, 3M Fire Protection Products.
- c. Fire Barrier CP 25S/L Caulk, 3M Fire Protection Products.

11. Firestop Mastic:

- a. Biostop 700 by The RectorSeal Corp.

2.04 GENERAL SYSTEMS

A. The following products and manufacturers are examples of acceptable products and combinations of products for the following general applications within the restrictions of the manufacturer's printed data:

- 1. Cable, metal pipe, insulated pipe, construction gaps, HVAC ductwork and certain plastic pipe applications under static conditions:
 - a. 3M Brand Barrier Moldable Putty MPS-2 STIX, CP 25WB/CP 25WB+ Caulk and Interam FireDam 150 Caulk.
 - b. Metacaulk 950 by Rectorseal Corp.
 - c. Hilti FS601 Elastomeric Firestop Sealant
- 2. Plastic pipe penetrations under static conditions:
 - a. 3M Brand Fire Barrier FS-195/FS-195+ Wrap or Strip used in conjunction with putty or RC-1 Collar.
 - b. Hilti FS 611A Intumescent Firestop Sealant
- 3. Multiple cables, large conduit and/or cable tray penetrations.
 - a. Hilti CP 657 Fire Blocks.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the Work of this Section and all work penetrating the openings is completed.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.

- C. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bone; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.03 APPLICATION

- A. Installing Through-Penetration Firestops: General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- E. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- F. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.04 CLEANING

- A. Clean Work under provisions of Section 01700.

- B. Clean adjacent surfaces of firestopping materials.
- C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 firestopping immediately and install new materials to produce firestopping complying with specified requirements.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

METAL SIDING**SECTION 07400****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Factory finished interior and exterior steel profile wall system for vertical application with exposed fasteners on secondary supports of heavy gauge galvanized steel furring channels at maximum 16" o.c. Provide clear anodized (Class I Clear Anodized Finish:AA-M12C22A41), 0.08" thick custom extruded aluminum trim/closure, i.e. back-to-back J-molding elements as indicated on the drawings at corners and panel joints, etc..
 - 1. Note: Hot-dip galvanized steel furring channels shall run perpendicular to the direction of the panel corrugations. Space between channels shall allow any entrapped moisture to evacuate to the wall base and discharge there. 2 piece angles stitched at horizontal leg overlap to allow adjustment for plumbness and tolerances. Provide for expansion and contraction of the panels and supports.
 - 3. Provide weep holes at 24" o.c. at the wall base trim to evacuate any water that enters the wall system
- B. All engineering, manufacturing and installation of the items specified herein are to be supplied by a single manufacturer and certified wall systems contractor, and have total responsibility for providing the wall and roof systems that perform as specified.
- C. Penetrations in wall panels required by other trades must be performed only by the siding installer

1.02 REFERENCES

- A. 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
- B. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. ASTM A792 - Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process, Structural (Physical) Quality.
- D. American Iron and Steel Institute (AISI): Specification for the Design of Cold-Formed Steel Structural Members.
- E. American Institute of Steel Construction (AISC): Code of Standard Practice.
- F. American Society of Civil Engineers (ASCE): ASCE-7, Minimum Design Loads for Buildings and Other Structures

1.03 SYSTEM DESCRIPTION

- A. Wall System: Preformed corrugated profile metal panels of prefinished galvanized metal, accessory components; and exposed fastener system installed on applied galvanized steel

furring channels on sheathed stud framing and masonry walls, and also applied to bi-fold doors.

1.04 DESIGN REQUIREMENTS

- A. Structural: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as required by and calculated in accordance with the International Building Code 2021 and Supplements (City of New Orleans Building Code) and ASCE 7-16, measured in accordance with ANSI/ASTM E330 and when tested in accordance with ANSI/ASTM E330 as follows based on wind pressures indicated in the S-series drawings, and corners as defined in Code
 - 1. Provide wall system, including gauge of metal panels, fastener type and size and also secondary support system size and gauge (specified sizes and gauges are minimums only)and application to meet the PSF load requirements calculated by ASCE/SEI 7-16 for field of wall and also corners
- B. Exterior wall system to withstand imposed loads with maximum allowable deflection of span: 1/240
- C. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental affect to system components.
- D. Size and fabricate wall systems free of distortion or defects detrimental to appearance or performance.
- E. Air Infiltration shall be tested in accordance with ASTM-E 283, with static air pressure differential of 10.00 psf; air infiltration rate shall not exceed 0.04* cfm per square foot of fixed wall area.
- F. Water Penetration is defined as the appearance of uncontrolled water within the wall construction. Tested in accordance with ASTM E-331, no water infiltration shall occur at a static pressure differential of 15 psf. Provision shall be made in to drain to the exterior any water leakage at joints and/or condensation taking place within the wall construction.
- G. Secondary supports for the wall system shall be designed in accordance with AISC, AISI

1.05 SUBMITTALS

- A. Submit under Section 01300.
- B. Submit panel shop drawings consisting of design and erection drawings, finish specifications, and other data necessary to clearly describe the design, materials, sizes, layouts, construction details, and erection. Submit small-scale layouts of panels and large-scale details of girts, edge conditions, joints, fastener and sealant placement, flashings, penetrations, and special details. Distinction must be made between factory and field assembled work. Shop drawings shall show the joint details providing a structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331.

- C. Indicate wall system dimensions, panel layout, general construction details, anchorages and method of anchorage.
- D. Product Data: Provide data on profiles, component dimensions, fasteners, and accessories.
- E. Manufacturer's Installation Instructions: Indicate preparation requirements, assembly sequence and installation.
- F. Samples:
 - 1. Panel: Full panel width by 12 inches long.
 - 2. Fasteners: Two (2) of each type with statement of intended use.
 - 3. Closure: One (1) metal closure and one (1) foam closure as required

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
- B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual" except as otherwise indicated.
- C. Installers Qualifications: The wall systems contractor shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements

1.07 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing Work of this section. See Section 01200 for requirements of this meeting. Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays
 - 3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels
 - 6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable
 - 7. Review temporary protection requirements for metal wall panel assembly during and after installation
 - 8. Review wall panel observation and repair procedures after metal wall panel installation.

Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings, instructed by the manufacturer.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be unloaded and stored per the manufacturer's instructions to prevent damage due to handling and weather

1.10 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, copings, soffits, and other adjoining work to provide a leakproof, secure, and non-corrosive installation

1.11 WARRANTY

- A. Paint Finish Warranty: The manufacturer shall warrant and agree to repair finish as approved by the architect or replace metal wall panes that show evidence of deterioration, fading, chalking, peeling, cracking, checking, chipping, or erosion to base metal of the exterior panel finish beyond specified finish performance standards for a period of twenty (20) years.
- B. Provide written warranty, signed by Contractor and Manufacturer, agreeing to repair or replace defective materials and workmanship of wall work during warranty period. Defective materials and workmanship are hereby defined to include abnormal deterioration, aging or weathering of the work, leakage of water or air, structural failure of components including rupturing, cracking or puncturing, , and failure of the work to fulfill other specified performance requirements, for the period of five (5) years from the date of substantial completion.

1.12 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide 10 extra new full size exterior corrugated siding panels (full width and full ground floor height) and 200 stainless steel fasteners as used for this installation to the Owner for their attic stock, Bundle panels and box fasteners for storage as approved by the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM TA446 Grade C G90 Coating A525; structural quality steel, Grade 50B, 50KSI yield strength.

- B. Wall Fasteners: Manufacturer's standard 300 series stainless steel with 5/8" bonded neoprene and stainless steel washers coated to match the exterior panel color.
- C. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing, cut or premoulded to match corrugation configuration of roofing and siding sheets. Provide where indicated and necessary to ensure weathertight construction.
- D. Sealing Tape: 100% solids, pressure sensitive grey polyisobutylene compound tape with release paper backing. Not less than 1/2" wide and 1/8" thick, non-sag, non-toxic, non-staining and permanently elastic. Hidden sealant at all side laps, end laps, and flashing details shall be gun grade non-curing butyl or polymeric non-skinning butyl tape to ensure weather tightness
- E. Joint Sealant: One-part or two-part elastomeric; polyurethane, polysulfide, or silicon rubber as recommended by building manufacturer complying with Federal Specification TT-S-00230C, TT-S-00227E, or TT-S-001543, Class A sealants.
- F. Secondary supports shall be fabricated from minimum 14 gage zinc coated steel conforming to ASTM A 653 SQ Grade 37, G90 coating. Thickness and shapes of members shall be as required to meet performance specified including pull out resistance of fasteners, but in no case less than 14gage.

2.02 CORRUGATED PANELS

- A Siding : Minimum 22 gauge preformed sheets; S-profile, 3/4" deep except 1/2" deep at Lobby, equal to "Econolap" by Centria:
 - 1. Panels shall be approximately 3' wide (34-5/8" nominal panel width), 1/2" high with rounded corrugations the entire length of the panel. Center to center dimension at the high point of each corrugation shall be from 2.6" to 2.7", providing a shallow profile.
 - 2. Panels shall be one piece in any single run length.
 - 3. The upper end of the steel panels shall be fabricated with a mitered cut on the major corrugations which will form a closure as it fits into the major corrugations roof panels.
 - 4. The bottom end of the panels shall be straight cut.
- B. Closure Pieces, Gutters, Caps and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
 - 1. Comply with SMACNA requirements.
 - 2. Hem all exposed edges of flashing on underside, 1/2 inch.
- C. Assembly and Installation Accessories: Provide manufacturer's standard brackets, clips, anchoring devices, spacers, flashings, joint sealers, expansion joints and other components needed for a complete permanently weatherproof installation. Use materials which are non-corrosive, non-deteriorating, and compatible with the panel faces
- D. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed shop cut and factory mitered to required angles. Back brace mitered internal corners with 24 gauge sheet

2.03 FINISH AT EXTERIOR PANELS

- A. Exterior panel material shall be factory coil coated 3 coat metallic finish system .
1. Exposed exterior surface finish shall be high performance fluoropolymer coloring coating meeting AAMA 2605.2 and containing thermocuring polyvinylidene fluoride, Kynar 500 or Hylar 5000, (70% solids by weight) supplied under license by manufacturers with minimum rated service life of 20 years as published by the manufacturer. Pre-treatment, mil primer, and finish coat(s) shall be factory baked-on of 1.5 dry mil thickness (minimum 0.2 dry mil primer, minimum 0.8 dry mil Polyvinyl Fluoride color coat and minimum .5 mil Polyvinyl Fluoride clear coat finish)..
 1. Exterior surface color shall be equal to Centria “XL Silver - Sundance Series 9957”.
 2. Concealed interior surface finish shall consist of a 0.2 mil primer and 0.3 mil backer coat
 2. Performance Requirements: Provide applied coatings of color selected by the Architect that meet or exceed the criteria of AAMA 2605.2 for the following tests, using the test procedures specified in AAMA 2605.2:
 1. Color Uniformity.
 2. Specular Gloss.
 3. Dry Film Hardness.
 4. Film Adhesion.
 5. Impact Resistance.
 6. Abrasion Resistance.
 7. Chemical Resistance.
 8. Corrosion Resistance.
 9. Weathering.
 10. Acid Resistance.
 11. Chalking
 3. Concealed interior surface finish shall consist of manufacturer’s standard primer, minimum of 0.25 dry mil thickness.
 4. Qualifications of Applicator: Licensed by the coating manufacturer. Use one applicator for all fluoropolymer coatings in the Project.

2.04 FINISH AT INTERIOR PANELS

- A. Baked Acrylic Enamel Finish (Interior Locations): AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
12. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.0 mils, medium gloss.

- a. Approved: "Duracron" by PPG or equal.
2. Color: Exposed surface color shall be equal to Centria "XL Silver - Sundance Series 9957".

PART 3 - EXECUTION

3.01 ERECTION

- A. Install in accordance with manufacturer's instructions.
- B. Install secondary supports, panels, flashings, trim and accessories in strict accordance with the panel manufacturers detailed written instructions covering the tools, fasteners, sealants, and assembly procedures required to achieve the structural, thermal, and weathering performance specified.
- C. Metal filings caused by cutting and drilling shall be immediately removed from finished surfaces to prevent rusting and staining.
- D. The wall panel systems contractor shall coordinate work with other trades as required to insure proper flashing and seals with adjoining construction.
- E. Fasten cladding system to structural supports, aligned level and plumb with exposed fasteners. install screw fasteners into structural supports with power tool having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes. Install panels in such a manner that vertical lines are plumb and horizontal lines are level. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F (-29°C to +82°C). Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation
 1. **Note:** Fasteners shall be a in a neat pattern and equally spaced as directed by the Architect using the required number of fasteners determined by the panel manufacturer.
- F. Install sealants and/or gaskets at all joints and openings as required for weathertightness.
- G. Work shall be coordinated with other trades as required to insure proper flashing and seals to intersecting construction.
- H. Do not allow panels or trim to come into contact with dissimilar materials.
- I. Attach panels using manufacturer's standard supports and fasteners, spaced in accordance with approved shop drawings and required by loading.
- J. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in

performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts. Protect installed panels and trim from damage caused by adjacent construction until completion of installation.

- K. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- L. Field cutting of exterior panels by torch is not permitted.
- M. Locate end laps over supports. End laps minimum two inches. Place sidelaps over bearing and shall overlap one major corrugation.
- N. Wall Sheets: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's recommendations.
 - 1. Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. Fasten window and door frames with machine screws or bolts. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
- O. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

3.02 INSTALLATION - ACCESSORIES

- A. Seal wall accessories watertight with sealant in accordance with manufacturer's instructions.

3.03 TOLERANCES

- A Siding : 1/8 inch from true position.

3.04 FIELD TESTING AND CORRECTION

- A. Field water tests by static test method at indicated psf load (no reductions allowed) for 15 minutes in accordance with ASTM E1105-15 with latest updates, shall be performed by the Contractor at his expense on at least four (4) completed portions of the wall selected by the architect. In the event that such testing should result in any leakage, eliminate the causes of such leakage at no additional cost to the Owner. Remedial measures must maintain standards of quality and durability and are subject to review by the Architect. Provide powered scaffold, hose, and sufficient personnel to operate scaffold and hose
 - 1. Cost of all tests and retesting shall be born by the Contractor.
 - 2. Testing shall be performed by qualified testing personnel approved by the Owner.
 - 3. Tests shall be performed for water infiltration with results of no uncontrolled water appearing on interior surfaces of the wall units.

4. One successful water tests at 10% completion shall be conducted at the Architect's direction and at his selected areas. Unsuccessful water tests will not be counted a fulfillment of this requirement.

END OF SECTION

MODIFIED BITUMEN ROOFING**SECTION 07500****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including General and Supplementary Conditions, and other General Requirements apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK

- A. **Asphalt modified bitumen roofing** shall include:

1. **Metal Deck:** New roofing system of and two (2) or more layers of insulation, tapered isocyanurate board (minimum 1 inch thick) mechanically fastened to metal deck and 1/2 inch cover board installed on top layer with adhesive and the base sheet of modified bitumen membrane applied and top layer with granular surfacing both applied by torched application, and parapet treatment and flashing systems applied by torched application..
 - a. Insulation shall provide an average R-value of 25
 - b. Provide walk pads where indicated on the drawings.
2. Provide roofing system, fastener type and spacing and application to meet the wind uplift requirements, as calculated by ASCE/SEI 7-16, and at metal deck application, add fasteners at the perimeter and corners as required by FM LPDS 1-29 and codes. The net design wind pressures below represent the net pressures (sum of internal and external) to be applied normal to each building surface, as required by and calculated in accordance with the International Building Code 2021 and Supplements (Orleans Parish) and ASCE 7-16, based on wind speeds indicated on the S-series drawings and increased at perimeter and corners as required by Codes figured without parapets.
4. Approved Roofing/Flashing Systems: Polyester dual Scrim systems as follows for torch application:
 1. **Siplast Inc.:**
Cap Sheet: Paradiene 30 HT FRTG .
Interply: Paradiene 20 PRTG.
Flashing: Veral Aluminum (138 mils/3.8 mm thick; weight 82 lbs per square;
 2. **Johns Manville Corporation:**
Cap Sheet: DynaKAP FRHW
Interply: . DynaWeld 180S
Flashing: DynaClad (158 mils/4.0 mm thick; weight 101 lbs per square, with fiberglass mat installed in a two ply system over a base layer of DynaBase)
 3. **Soprema, Inc.**
Cap Sheet: Sopralene flam 180 FR GR (torch applied)
Interply: Sopralene flam 180 (torch applied).
Flashing: Sopralene Flam 180 (torch applied) and Sopralast TV Aluminum, lbs per square), torch applied.

4. Firestone Building Products Company

Cap Sheet: SBS Premium FR Torch White.

Interply: SBS PolyTorch Base

Flashing: Firestone SBS Metal Flash-AL, (150 mils/3.8mm thick; weight 100 lbs. per square with glass fiber/scrim mat) heat fused.

General notes:

- a. All foil faced flashing products shall be resistant to thermal shock.
 - b. Flashing systems are to be two ply systems (specify backer ply).
 - c. Note: If required, provide heavier base sheets or other components if required by the roofing manufacturer for the application being used, i.e. hot asphalt , etc.
 - d. Provide liquid flashing system (catalyzed acrylic resin and fleece inner layer) at precast concrete components, where indicated on the drawings and also at pipe and other similar penetrations. AT the precast surface install grey color system or embed granules to produce grey color.
5. If application methods and materials are required to differ from those listed above due to new or existing slopes that are in excess of the slope limit of the specified systems, provide materials and application methods as recommended by the roofing manufacture for those conditions. It is the Contractor's responsibility to verify all slopes and coordinate with roofing manufacturer's requirements.
5. Provide specified insulation with thicknesses to provide an average R-value of 30.
6. At all roof drains, provide one-piece 4' x 4' sloped polyiso insulation board pre-manufactured drain sets to accomplish a sump,. 1.5" minimum thickness, equal to Gemini™ Drain Sets by Atlas
7. See drawings for products/model numbers for bellowed expansion joints for roof and wall junctures to accommodate movement with factory formed transition components at vertical extensions and any "change-in-direction conditions as indicated on the drawings. The joint shall be packed with compressible batt thermal insulation.
- B. Sheet metal work shall include:
1. New stainless steel metal flashings, scuppers, downspouts, etc as indicated on the drawings associated with the modified bitumen roofing. Pre-engineered copings and gravel stops are specified in Section 07620-Flashing and Sheetmetal
 2. Lead vents.
- C. Rough Carpentry: Treated wood nailers.

1.03 QUALITY ASSURANCE

- A. Thermal Performance: The roofing system, including roofing, (not including ceiling), and insulation (thickness as required) shall provide an minimum average R-value of 25 with minimum thickness at low point of 1.5 inch thickness.

1. "R" values required are based on requirements of SPR R 257-55 the U.S. Department of Commerce.
 2. Provide insulation thicknesses required to achieve slopes indicated which may provide better thermal performance than specified above.
- B. Insulation shall have a flame spread of 25 or less and smoke developed factor of 450 or less per ASTM E84.
- C. Installer: Roofing and sheet metal work shall be by a single firm that has been in business at least five (5) years, called the Installer in this Section, specializing in the type(s) of roofing required, so that there will be undivided responsibility for the performance of the work.
- D. Installer shall be certified as an approved applicator in writing by the roofing materials manufacturer prior to award of contract for the installation of a fully guaranteed roof as required by this specification.
- E. UL Rating: Provide materials and roofing systems which have been tested, listed and labeled by UL for the following Class or Rating as roofing:
- F. Provide "Class A" rating, except as otherwise indicated.
- G. Factory Mutual Rating: Provide materials and roofing systems which have been tested and rated by Factory Mutual Research Corporation for compliance with Class I construction when applied in accordance with Factory Mutual Loss Prevention Data Sheet 1-28 and the Factory Mutual Approval Guide.
- H. Manufacturer of Roofing Materials: Obtain primary materials from a single manufacturer, who publishes complete information on the required system, and offers to guarantee or bond the completed roofing installation as required. Obtain secondary materials from sources acceptable to the manufacturer of the primary materials.
- I. The roofing system product supplier shall furnish the Roofing Contractor with Material Safety data Sheet/Sheets (MSDS), incorporating OSHA approved form, current edition. Said sheets shall be available at the site at all times until project completion.
- J. On Site Inspector: The Owner may require that an inspector be in attendance continually from the beginning of roofing operations.

1.04 MODIFIED BITUMEN CRITERIA

- A. General Requirements: All SBS membrane systems shall be a multi-layer, homogeneous roofing sheet assembly with a granular surfacing on the cap sheet layer. All roofing sheets shall be made with identical SBS blend formulations and manufactured using the same process for sheet construction.
- B. Performance Features: All SBS membrane systems shall have the following performance features as a minimum.
1. Phased Construction: Each SBS sheet shall be manufactured as an independent

waterproofing layer. The independent waterproofing layer design shall allow for phased construction between layers.

2. Granule Surfacing: The finished membrane system shall have a factory applied granule surfacing to allow for ease of inspection, maintenance and repair.
3. Detail Treatments: The SBS membrane terminations and associated roof penetrations shall be waterproofed using conservative detail configurations according to the following basic criteria.
 - a. Flanged metal flashings shall be set in mastic over the first SBS layer and waterproofed using a minimum of 2 additional layers of the SBS membrane.
 - b. Walls, curbed penetrations, etc. shall be waterproofed using a minimum total of 4 layers of the SBS membrane at junctures of the roof deck to the penetration. The 4 layered construction shall consist of: SBS base ply layer; SBS reinforcing ply layer; SBS cap sheet layer; SBS flashing sheet layer.
4. Underwriters Laboratories Rated: The SBS membrane system shall be UL rated Class A without the necessity for maintenance oriented coatings or surfacings.
5. Physical Properties: Each SBS sheet shall have the physical properties as a minimum specified under Part 2 herein.

1.05 PRE-INSTALLATION CONFERENCE

- A. Approximately two weeks prior to beginning of roofing operations, the roofing Contractor shall arrange to meet with the Architect, his inspector (if any), a representative of the material's manufacturer, and his project foreman which will be required to be on the roof at all times when any roofing is being done, for the purpose of reviewing specification requirements, construction procedures, and the prevalent job conditions under which the work is to be performed.
 1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
 4. Review loading limitations of deck during and after roofing.
 5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
 7. Review temporary protection requirements for roofing system during and after installation.

8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.06 ACCEPTANCE OF ROOF DECK

- A. Roofing Contractor shall inspect the roof deck and shall either accept the roof deck or shall indicate to the General Contractor where the deck is not acceptable for proper application of the roofing membrane.

1.07 NOTIFICATION OF START OF WORK

- A. The Contractor shall notify the Architect of his intention to begin work not less than 48 hours (2 working days) in advance so that arrangements may be made for an inspector to be present. No work is to be performed without the presence of the inspector.

1.08 SUBMITTALS

- A. Manufacturer's Data: Submit two copies of specifications, installation instructions and sample warranty from the manufacturer for each major roofing product, insulation and sheetmetal required. Include data substantiating compliance with the requirements. Indicate by transmittal form that the Installer has received a copy of the manufacturer's instructions and recommendations.
- B. Furnish approved application recommendations which must include itemizing sequences of applications to provide for (1) inspection and approval by the Manufacturer's representative and the Owner's representative of the first ply or interply membrane complete with flashing installation prior to (2) application of the cap sheet and final finishing work on the flashings, both base and edge.
- C. Contractor's Certification: The Contractor shall certify in writing that the materials he will be using in the roofing system(s) shall be in accordance with the specifications.
- D. Shop Drawings showing layout, sheetmetal profiles, methods of joining, and anchorages details, including counter-flashings, and expansion joint covers. Provide layouts 1/4 inch scale and details at 3 inch scale. Also submit tapered insulation layout and components to achieve the specified R-25 value and slopes of 1/4" per foot.
- F. Submit, in a ring binder, three (3) copies of all roofing data, including manufacturer's catalogs/manuals of materials and accessories used in the Project, including manufacturer's Maintenance recommendations, for distribution to the User and Umbrella Agencies as directed by the Owner. See Section 01700 - Project Closeout.

1.09 STORAGE AND HANDLING

- A. All materials shall be stored off the ground on pallets and protected from damage and moisture by tarpaulins. Do not store felts or roofing materials on the ground or over new concrete floors. Stack roofing felt or roofing materials on the ground or over new concrete floors. Stack roofing felt reels on end during storage. No damp felts, insulation, or gravel shall be used. Avoid prolonged storage of felts at the site. All materials must be absolutely

dry and in good condition when ready for use. All materials which in the opinion of the Architect, have become damaged or otherwise unfit for use during delivery or storage shall be replaced at the expense of the Contractor.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Precipitation; Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application.
- B. Temperature Restrictions-asphalt: At ambient temperatures of 40 degrees F and below, special precautions must be taken to ensure that the specified Type IV asphalt maintains a minimum acceptable 400 degrees F at the point of sheet application. The asphalt must not be overheated to compensate for cold conditions, Kettles, carts, etc shall be insulated. Luggers and carts shall never be more than half filled at all times.
- C. Temperature Restrictions-cold adhesive: At low temperatures, the specified adhesive becomes more viscous, making even distribution more difficult. The optimal temperature is 70 degrees F. To facilitate application when ambient temperatures are below 50 degrees F, store the adhesive and roll goods in a warm place immediately prior to use. Roll or broom the sheets to ensure contact with underlying adhesive. Suspend application where the adhesive cannot be kept at temperatures allowing for even distribution.

1.11 PROTECTION REQUIREMENTS

- A. Torch Safety: Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas of the roof construction. Continue the fire watch after roofing material application has been suspended for the day.
- B. Debris Removal: Remove all debris daily from the project site and take to legal dumping area authorized to receive such materials.

1.10 WARRANTY

- A. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's watertight "No Dollar Limit" membrane guarantee acceptable to the Owner, for labor and material of insulation, roofing membrane including flashing endorsement, signed by an authorized representative of the roofing manufacturer, on form which was published with product literature as of the date of Contract Documents, for the following period of time. The roofing guarantee shall not exclude random areas of ponding from the coverage defined as "no standing water after 48-hours from the last rain".
 - 1. Twenty (20) years from date of substantial completion, including specified wind loads.
- B. The Roofing Manufacturer's Warranty shall guarantee at the manufacturer's own cost and expense, to make or cause to be made such repairs to or replacement of, to correct any and all faulty installations or materials of the roofing system, to keep the roofing system in a watertight condition throughout the 20 year guarantee period. The guarantee shall not be prorated. The executed guarantee shall be delivered to the Architect in three original counterparts prior to acceptance of the Work. No signature by the Owner shall be required.

PART 2 - PRODUCTS

2.01 MATERIALS GENERAL

- A. General: Furnish the specified materials for this roofing operation. Furnish all accessories necessary for a complete roofing and sheet metal job even if not specifically shown or specified. Substitution of any other materials or assemblies will not be permitted without prior approval before bid time.
- B. Primer: Provide primer on all substrates to receive roofing components. Primer(s) shall be as recommended by roofing component manufacturers.

2.02 ASPHALT MODIFIED BITUMEN ROOFING

- A. Roofing Membrane Assembly: The roof membrane assembly shall consist of two (2) plies of a prefabricated, fiberglass reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane. The cap sheet shall have factory applied granular surfacing. The modified bitumen base ply shall be fully adhered to the prepared substrate as specified herein, and shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system. The modified bitumen cap sheet membrane shall be fully adhered to the modified bitumen base ply as specified herein.
- B. Flashing Membrane Assembly: The flashing membrane assembly shall consist of a prefabricated, fiberglass scrim-mat reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing. A low softening point asphalt shall be incorporated into the membrane between the metal foil surfacing and the SBS modified bitumen asphalt membrane, at the channels, in order to preclude foil delamination during daily thermal cycling.
- C. Granule Surfaced Two-Ply SBS Roofing Membrane System: As follows:
 - 1. Modified Bitumen Base Ply in accordance with ASTM D5147 Test Method:
 - a. Compound Stability: Min. 100°C (212°F)
 - b. Low Temperature Flexibility: @-25°C (-13°F)
 - c. Elongation @23°C (73°F): 3% min. @ 5% max. load
 - d. Dimensional Stability: <0.1%
 - e. Elongation @-18°C (0°F): 4.5%
 - f. Ultimate Elongation*: 50%
 - g. Water Absorption (Maximum): 2%
 - 2. Modified Bitumen Cap Sheet in accordance with ASTM D5147 Test Method:
 - a. Compound Stability: Min. 100°C (212°F)
 - b. Low Temperature Flexibility: @-25°C (-13°F)
 - c. Elongation @23°C (73°F): 3% min. @ 5% max. load
 - d. Dimensional Stability: <0.1%
 - e. Granule Embedment*: <1.5 g. per sample*

- f Breaking Load @-73°F (Ave): 30 lbf/inch
- gb. Ultimate Elongation^{**}: 55%

* This test is based on #11 ceramic coated granules used as surfacing. Using this granule type, there are approximately 6 grams total in the abraded test area.

** Ultimate elongation is measured at the point on the stress-strain curve where the load is reduced to 5% of the reported tensile strength.

D. SBS Flashing Membrane Sheet

1. Modified Bitumen Flashing Sheet in accordance with ASTM D5147 Test Methods:

- a. High Temperature Compound Stability: Min. 116°C (240°F)
- b. Low Temperature Flexibility: -20°C (-5°F)
- c. Tensile Strength (lbs/in.): 100 lbs.
- d. Dimensional Stability: 0.5% max.
- e. Ultimate Elongation^{**}: 40%

** Ultimate elongation is measured at the point on the stress-strain curve where the load is reduced to 5% of the reported tensile strength.

E. Primer: Primer(s) shall be as recommended by roofing component manufacturers.

1. At wood use asphalt primer complying with ASTM D-41.

F. Asphalt Bitumen: ASTM D 312, Type IV

G. Cant Strips: Fibrous adhered in system complying with uplift requirements.

H. Flashing Cement: ASTM D 2822 Bituminous plastic roofing cement, non-asbestos containing formulation or ASTM D4586, Type II.

I. Lead sheet: Fed. Spec. QQ-L-201, Grade D, hard lead, 4.0 lb.

J. Walkway Protection Board: As part of roofing system; equal to Paratred with CR finish, as a part of the roofing system prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface to match CR finish ply and as follows:

- 1. Thickness: 0.217 in (5.5 mm)
- 2. Weight: 1.8 lb/ft² (8.8 kg/m²)
- 3. Width: 30 in (76.2 cm)

K. Mechanical Anchors: Type 304 stainless steel, type and size as specifically recommended by the insulation manufacturer for the type of deck used and complying with specified wind load rating requirements.

L. Catalyzed Acrylic Resin Liquid Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer,

basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application. Provide Parapro 123 Flashing System by Siplast or equal systems by specified manufacturers.

- M. Low Rise Foam Adhesive: Single component polyurethane adhesive dispensed from a portable pre-pressurized container requiring no external power source- range of working temperatures (33° F/0.5° C to 111° F/43° C. Equal to INSTA STIK™ Quik Set Commercial Roofing Adhesive by Insta-Foam Products, Div. of Dow Chemical Corp and “OlyBond500” adhesive by OMG

2.03 SHEET METAL AND ACCESSORIES

- A. See Section 07620

2.04 ROOF INSULATION

- A. Base Layer (Straight and Tapered): A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers. The isocyanurate panel shall be in full compliance with ASTM C1289, Type II, Class1, Grade 1. The panels shall have a minimum thickness of 1 inch and total nominal thickness indicated on the drawings. The insulation, for thermal performance, shall provide an R-value of 10 for each 1.5 thickness installed. Acceptable types are as follows:
 - 1. Equal to “Tapered Partherm” by Siplast, AC Foam II by Atlas Energy Products, and ISO 95+ Insulation by Firestone Building Products, Inc.
 - 2. Crickets shall have a minimum of 1/4" per foot slope
- B. Overlay Panels: Nonstructural, non-woven, non asphaltic glass matts embedded into both faces and 500 PSI moisture-resistant treated faced gypsum core, “Securock” by USG, not requiring priming and compatible with specified roofing system-no substitutions.
 - 1. Insulation panels installed in Low Rise Foam Adhesive shall have a maximum panel size of four (4) feet x four (4) feet.

PART 3 - EXECUTION

3.01 GENERAL

- A. All surfaces to be covered shall be smooth, dry and free from dirt, debris and foreign material which will affect the adherence and integrity of the specified materials. Installation of the roofing felts constitutes the acceptance of the roof deck by the Installer.
- B. Do not place any load on the roof that will exceed the safe design load.
- C. Provide barricades and, where necessary, signs to ensure the safety of the general public and

other workmen on the job from fire and falling materials.

- D. The Roofing Contractor shall be responsible for the proper attachment of the specified work to any work embedded in, in contact with, or forming an integral part of the specified roofing system.
- E. All roof areas shall be accurately laid out for proper lap and sequence of plies, and all plies laid to chalked line. Each ply shall be broomed in place. Felts shall be free from fishmouths, buckles, blisters, or other faulty workmanship.
- F. Water Cut Offs: Provide water cut-offs at the end of each day's work or whenever operations cease due to weather conditions. Water cut-offs shall seal the exposed edges of roof insulation and shall consist of two plies of No. 15 tarred felt extending from a point 12" on the roof deck carrying up and over the roofing and extending 6". Hot mop both edges so that they are weathertight. Follow with a glaze coat. Remove the cut-off before commencing work at that point at a later date.
- G MAINTAIN A FIRE WATCH FOR TWO (2) HOURS AFTER TORCHING OPERATIONS AS WELL AS WALKING THE ENTIRE ROOF CHECKING FOR "HOT SPOTS" BY USING AN INFRARED HEAT-SENSING THERMOMETER

3.02 INSULATION

- A. Comply with the manufacturer's instructions for the particular condition of installation including treatment at edges of each insulated area. Extend insulation in thickness as shown over concrete deck. Cut and fit tightly around obstructions, and fill voids with insulation and mastic. Form crickets and tapered areas as shown and as required for proper drainage of the membrane.
- B. Apply with low rise foam adhesive in strict accordance with manufacturers printed instructions. Run long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows. Stagger joints two ways in each course by not less than 1/3 of the narrow boards dimension

3.03 ASPHALT MODIFIED BITUMEN ROOFING INSTALLATION

- A. Asphalt Modified Bitumen Roofing: Two (2) plies of modified bitumen asphalt membrane set in asphalt bitumen equal to systems specified installed in strict accordance with roof manufacturer's printed instructions.
- B. Priming: Prime metal flanges (all jacks, edge metal, lead drain flashings, etc.) and concrete and masonry surfaces with a uniform coating of asphalt primer ASTM D-41-73.
- C. Roofing Application: All layers of roofing shall be laid free of wrinkles, creases or fishmouths. Sufficient pressure shall be exerted on the roll during application to ensure prevention of air pockets. Lap seams of the cap sheet layer. The courses shall be staggered to ensure this.
 - 1. All layers of roofing shall be laid in relation to the slope of the deck as recommended by the manufacturer.
 - 2. The base ply shall be fully bonded to the prepared substrate and shall have a minimum of three (3) inch side and end laps. Each sheet shall be applied directly behind the asphalt applicator.

3. The cap sheet shall be bonded to the base ply and have a minimum of three (3) inch side and end laps.
 4. Sufficient pressure shall be exerted on the metal clad modified bitumen sheet to ensure the prevention of air pockets. This can be accomplished by using a damp, kitchen type sponge mop or a damp, heavy duty cotton nap paint roller.
 5. All end laps of the metal-clad modified bitumen flashing sheet shall be primed with a uniform coating of the specified asphalt primer and allowed to thoroughly dry prior to overlapping of adjoining sheets.
 6. All side laps of the metal-clad modified bitumen flashing sheet shall be heat fused to ensure a complete seal.
 7. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds one-half (1/2) inch per foot. The manufacturer shall provide acceptable sheet lengths and the required for all roofing sheet applications to applicable roof slopes.
- D. Granule Embedment: Mineral granules shall be broadcast over all bitumen overruns on the cap sheet surface, while the bitumen is still hot, to ensure a monolithic surface color.
- E. Flashing Application at Vertical Walls: Flashing shall be accomplished using the reinforcing sheet and metal foil flashing membrane. The flashing shall be applied in three foot lengths (cut from the end of roll) using the factory selvage edge for laps. The reinforcing sheet shall be lapped a minimum of three (3) inches to itself and shall extend a minimum of three (3) inches onto the base surface and three (3) inches up the parapet wall above the cant. Lap seams in the reinforcing layer shall never coincide with the laps of the metal foil flashing layer. The reinforcing sheet shall be adhered by a mopping of asphalt both wall and sheet. After the cap sheet has been applied to the top of the cant, the surface area that is to receive flashing coverage shall be prepared by torch heating granular surfaces or application of asphalt primer to foil surfaces allowing primer to dry thoroughly. The metal foil flashing sheet shall be torched in place. Pressure shall be exerted on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. All loose laps and edges shall be checked and sealed. The top edge of the flashing shall be nailed on nine (9) inch centers.
- F. Use Of Metallic Powder: Metallic powder shall be broadcast over all bitumen overruns on the metal foil membrane surface color.
- G. Lead Pipe Flashings: The lead flanges shall be completely primed and allowed to dry prior to installation. After the base ply has been applied, the flange shall be set in mastic and stripped in using nine (9) inch wide strips of the base ply material. The cap sheet shall then be applied, terminating at the flange-sleeve juncture of the pipe flashing.
- H. Sheet Metal Components: In all cases, unless otherwise approved by the roofing manufacturer, flanged components shall be incorporated into the system between the application of the base ply and the cap sheet. The flange must be primed with a uniform coating of approved ASTM D41-73 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.
- I. Catalyzed Acrylic Resin Liquid Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.

3.04 ROOF DRAINS

- A. Lead Drain Flashings: The lead drain flashing shall be completely primed and allowed to dry prior to installation. After the base ply has been applied, the lead flashing sheet shall be set in mastic and formed to turn down inside of the drain bowl. The perimeter of the lead flashing shall be plied-in using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of three (3) inches. The cap sheet shall then be applied, extending beyond the clamping ring seal. The clamping ring shall then be installed with all clamps, bolts, etc., in place.

3.05 EXPANSION JOINTS

- A. A. Install all components of the system in accordance with the manufacturer's instructions. The system is to be wholly encapsulated between the plies of the modified bitumen membrane in a roofing/waterproofing by torching.
- B. Slit the modified bitumen base ply with a knife along the joint gap. Refer to the manufacturer's instructions for the preparations and torching of the expansion joint material. Torch the prepared expansion joint material to the substrate, making sure that the expansion joint material is firmly and uniformly set, without voids, into the liquefied asphalt. Torching is carried out by the liquefaction of the modified bitumen base sheet and the expansion joint material rolled into it. Flame can be directed at the expansion joint material. At all times observe the modified bitumen manufacturer's recommendations and safety instructions. The expansion joint material must be completely encapsulated in the hot asphalt/bitumen and a bitumen bead visible along expansion joint material selvage edge.
- C. Torch the modified bitumen stripping plies smooth, free from air pockets, wrinkles, fish mouths, or tears. When torching, direct the flame away from the expansion joint material gland material, use the torch and flop technique. Install each stripping ply; shingle lap fashion, onto the expansion joint material firmly and uniformly, without voids. At all times observe the modified bitumen manufacturer's recommendations. The expansion joint material must be completely encapsulated in the melted bitumen and a bitumen bead visible along the expansion joint material selvage edge
- D. Attach a modified bitumen sheet to one side of the expansion joint. This is achieved by torching the modified bitumen sheet to the already installed modified bitumen cap ply.

3.06 ROOF ACCESSORIES

- A. Install roof accessories in accordance with manufacturer's recommendations. All roof accessories shall be left in a clean and first class condition.

END OF SECTION

FLASHING AND SHEET METAL**SECTION 07620****PART 1 - GENERAL****1.01 SECTION INCLUDES:**

- A. Metal copings; factory finished aluminum system
- B. Miscellaneous stainless steel metal flashings, counterflashing, and accessories. Install red rosin paper under all stainless steel components
- C. Prefinished galvanized sheet metal roof edge metal, scuppers, gutters and downspouts.
- D. Miscellaneous flexible sheet membrane flashings

1.02 RELATED SECTIONS

- A. Section 07500 – Modified Bitumen Roofing.

1.03 SUBMITTALS

- A. Manufacturer's Data: Submit two copies of specifications, installation instructions and sample warranty from the manufacturer for flashing and sheetmetal required. Include data substantiating compliance with the requirements.
- B. Sheetmetal Shop Drawings: Showing layout, profiles, methods of joining, and anchorages details. Provide layouts 1/4 inch scale and details at 3 inch scale.
- C. Samples of the following sheet metal and accessory items:
 - 1. 8 inch square samples of specified sheet materials to be exposed as finished surfaces.
 - 2. 12 inch long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.

1.04 QUALITY ASSURANCE

- A. Insurance Requirements: Provide fascia systems complying with Factory Mutual Loss Prevention Data Sheets 1-49 "Perimeter Flashing" requirements in either of the following categories and wind zones.
- B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual" except as otherwise indicated.
- C. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as required by and calculated in accordance with the International Building Code 2021 and Supplements (local City) and ASCE 7-16, based on wind speed indicated on the S-series drawings; and corners as defined in Code.
- D. The edge metal products shall be UL Classified by Underwriters Laboratories, Inc.® or other

3rd party verification of compliance with the ANSI/SPRI ES-1 thru 3 (as applicable) Wind Design Standard for Edge Systems Used with Low Slope Roofing.

1.05 WARRANTY/GUARANTEE:

- A. Manufacturer's Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall at their option repair or replace them. For decorative finish warranty, consult manufacturer.
 - 1. With 16 gauge cleat - 25-Year Warranty: Manufacturer shall guarantee that a standard size roof edge system, when installed per manufacturer's instructions, will not blow off, leak, or cause membrane failure, in wind conditions up to 155 mph, or the manufacturer shall replace or repair its materials.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS AND ACCESSORIES

- A. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- B. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; minimum 24 gauge except as required for loads and SMACNA
 - 1. Solder: ASTM B 32 50% tin, 50% lead with flux approved for use with specified steel sheet metal.
- C. Prefinished Galvanized Sheet Metal: Commercial quality carbon steel sheets with minimum of 0.20% copper content complying with ASTM A 526, except provide ASTM A 527 where lock-forming is required; hot-dip galvanized to comply with ASTM A 525, designation 90, prefinished with specified PVF2 coating; minimum 24 gauge unless otherwise noted or required by SMACNA for particular application.
 - 1.. High Performance Finish Coating: AA-C12C42R1x (cleaned with inhibitive chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment and painted with organic coating specified below). Apply in strict compliance with coating and resin manufacturer's instructions using a licensed applicator.
 - 2. Fluorocarbon PVF 2 Coating: Inhibitive thermo-cured primer, minimum 0.2-mil dry film thickness, and thermo-cured fluorocarbon coating containing 70% strength "Kynar 500" or "Hylar 5000" resin, two coat system with minimum 1.0-mil dry film thickness complying with AAMA 2605
- D. Miscellaneous Materials and Accessories:
 - 1. Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.

2. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
3. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
4. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.
5. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealers".
6. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching material being installed, noncorrosive, size and gage required for performance but not less than item being anchored.
7. Roofing Cement: ASTM D 2822, asphaltic.

2.02 SHEETMETAL FABRICATION

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated.
 1. Exposed edges folded back to form hems.
- B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- C. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- D. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints)..
- F. Gutters: Form in sections not less than 8 ft. in length, complete with end pieces, outlet tubes, and any special pieces that may be required. Join sections with riveted and soldered or sealed joints. Unless otherwise indicated, provide expansion-type slip joint at the center of runs. Furnish gutter supports spaced at 30" o.c., constructed of same metal as gutters.
- G. Downspouts: Formed in sections approximately 10 ft. long, complete with elbows and

offsets. Join sections with minimum 1-1/2" telescoping joints. Provide fasteners for top, bottom, and 4' o.c. intermittently between, designed to securely hold downspouts not less than 1" away from walls

2.03 ALUMINUM COPING

- A. Interlocking Multi-Part Coping System: Manufacturer's standard system consisting of coping formed from factory finished aluminum steel to profile and of thickness indicated, zinc-coated 16 gauge cleat located at coping joint, and formed aluminum gutter chair or gutter/splice plate or compression pad/gutter; with prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners.
1. Thickness of Coping: 0.063 inch.
 2. Design Load: specified herein.
 3. Products: Equal to "Permansnap Plus Coping"; W.P. Hickman Co. and products by M Systems Corp., Metal-Era Inc. and Petersen Aluminum Corp.

2.04 FINISHES

- A. High Performance Finish Coating on Aluminum: AA-C12C42R1x (cleaned with inhibitive chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment and painted with organic coating specified below). Apply in strict compliance with coating and resin manufacturer's instructions using a licensed applicator.
1. Fluorocarbon PVF 2 Coating: Inhibitive thermo-cured primer, minimum 0.2-mil dry film thickness, and thermo-cured fluorocarbon coating containing 70% strength "Kynar 500" or "Hylar 5000" resin, minimum 1.0-mil dry film thickness complying with AAMA 2605-11.
 2. Color: Manufacturing Standards as selected by the Architect.

2.05 MEMBRANE SHEET FLASHINGS

- A. Rubberized Asphalt Sheet Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized asphalt compound 32 mils thick, bonded completely and integrally to a high-density, cross-laminated polyethylene film, 8 mils (0.2 mm thick, to produce an overall thickness of 40 mils (1.0 mm), Perm-A Barrier by W.R. Grace and equal product by Sandal.
1. Primer: Flashing manufacturer's standard product or product recommended by flashing manufacturer for bonding flashing sheets to masonry and concrete

PART 3 - EXECUTION

3.01 SHEET METAL

- A. Furnish and install sheet metal roof edges, copings, flashing and counterflashing and protrusions in a manner indicated or implied by the Plans and Specifications and as recommended by the manufacturer and SMACNA.
- B. Join sheet metal using a flat locked seam or lapped and securely soldered joints. For gravel

guards butt ends together and furnish a joint cover 4" wide, fully bedded in flashing cement, and securely locked to the gravel guard. Make allowance at all joints for expansion and contraction. At exposed edges, sheet metal shall be hemmed and returned upon itself 1/2" for strength. At lap joints, make hems together so that one slides into the other. Nail down all metal flanges 3" on center.

- C. All corners shall be factory fabricated.
- D. All items passing through the roof whether shown or not shall be provided with collar and umbrella flashing or pipe penetration seals.
- E. Metal Pipe Flashings: Consist of a two (2) component assembly as follows:
 - 1. The first component shall be a stainless steel roof jack having a minimum four (4) inch perimeter flange, and a sleeve opening to fit closely around the penetration without forcing, with a minimum eight (8) inch height. All metal laps shall be fastened and soldered.
 - 2. The second component shall be a stainless steel metal, watertight umbrella, fabricated to be mechanically secured tightly by stainless steel drawband around the roof penetration and extended beyond the roof jack opening by a minimum radius of three (3) inches. The top edge of the watertight umbrella shall be caulked using an approved sealant.
- F. Set coping in a full bed of mastic using four (4) inch cover plates at joints, tightly fitted. Space joints equally and equal at ends. No section shall be smaller than 4'-0" in length.
 - 1. Where blocking is shown, provide treated wood continuous under the sheetmetal or fibrous tapered edge strip set in mastic and one layer of felt.
- G. Cleaning: Upon completion, all exposed sheet metal work shall be cleaned of all grease spots, oil, dirt, solder spatter, and the work shall be left in a clean and first class condition.
- H. Underlayment: Provide rubberized bitumen membrane flashing at under all copings.
- I. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- J. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- K. Install gutters and downspouts in accordance with SMACNA; slope gutters for positive drainage
- L. Downspouts shall be installed with a minimum of three (3) straps for every 8 ft. of run
- M. Metal edge securement shall be designed and installed in strict accordance with ANSI/SPRI ES-1, except basic wind speed shall be determined from Figure 1609 of the 2006 edition of the International Building Code. Nailer securement shall resist a vertical load of 200lb/Ft or the design load, whichever is greater. Bolts shall be staggered to avoid splitting the wood. Fasteners shall be located approximately 4 inches but not less than 3 inches from each end of

the wood blocking Fasteners shall be staggered, spaced at a maximum 12 inches on center and penetrate the wood sufficiently to achieve the design pullout resistance. Spacing of fasteners shall be on maximum 6 inch centers in corner regions of the building Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous, waterproof system.

3.02 RUBBERIZED SHEET MEMBRANE FLASHINGS

- A. Prepare substrate surfaces so that they are smooth and free from projections that could puncture flashing. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer. Prime if recommended by the manufacturer
- B. Install membrane and seal penetrations in strict accordance with the membrane manufacturers printed instructions. Turn up ends not less than 4" to form a continuous pan where installed horizontally. Roll edges and joints to eliminate "fishmouths".

END OF SECTION

ROOF ACCESSORIES**SECTION 07800****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Prefabricated roof equipment supports. See mechanical for rooftop units that include curbs.
- B. Prefabricated cowl type pipe curbs, see attached detail
- C. Prefabricated pipe curbs and pipe roller supports where conduit, piping, etc is located on the roof.
- D. Walkway protection boards as indicated on the drawings.

1.02 RELATED SECTIONS

- A. Division 7 - Roofing and Sheetmetal
- B. Division 15 - Mechanical: Mechanical equipment, penetrations and accessories.
- C. Division 16 - Electrical: Conduit passing through roof.

1.03 SUBMITTALS

- A. Submit under provision of Section 01300.
- B. Product Data: Provide product data on system including flashing materials, and insulation.
- C. Shop Drawings: Submit shop drawings of units where Product Data does not adequately depict the units. Include roof plan indicating model numbers at required roof accessory locations.

1.04 PRE-INSTALLATION CONFERENCE

- A. Review procedures and coordination required with related Work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, sealed and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

1.06 COORDINATION

- A. Coordinate the work with the installation of roofing and associated metal flashings, as the work of this section proceeds.

PART 2 - PRODUCTS

2.01 MISCELLANEOUS SHEETMETAL

- A. 24 gauge stainless steel sheet metal.
- B. Metal Pipe Flashings: Consist of a two (2) component assembly as follows:
 - 1. The first component shall be a metal roof jack having a minimum four (4) inch perimeter flange, and a sleeve opening to fit closely around the penetration without forcing, with a minimum six (6) inch height. All metal laps shall be fastened and soldered.
 - 2. The second component shall be a metal, water tight umbrella, fabricated to be mechanically secured tightly around the roof penetration and extend beyond the roof jack opening by a minimum radius of three (3) inches. The top edge of the watertight umbrella shall be caulked using an approved sealant.

2.02 MATERIALS

- A. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.
- B. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thickness indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2" thick.
- D. Fasteners: Same metal as metals being fastened, or non-magnetic stainless steel or other non-corrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
 - 1. Where removal of exterior exposed fasteners affords access to building, provide non-removable fastener heads.
- E. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
- F. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.
- G. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- H. Elastomeric Sealant: Generic type recommended by unit manufacturer, which is compatible with joint surfaces; comply with FS TT-S0027, TT-S-00230, or TT-S001543.
- I. Roofing Cement: ASTM D 2822, asphaltic.

2.03 PRODUCTS AND FABRICATION, GENERAL

- A. Provide manufacturer's standard products except as otherwise indicated and comply with applicable recommendations and details of the "Architectural Sheet Metal Manual" by SMACNA for custom fabricated work.
- B. Fabricate units to withstand 40-lb. live loading, except for other superimposed loading as shown.

2.04 PREFABRICATED ROOF EQUIPMENT SUPPORTS

- A. Provide roof equipment supports as manufactured by The Pate Company, Custom Curb, Inc., or Thybar Corp. as required for type of roof construction. Curbs shall be of box section design, heavy gauge structural quality galvanized steel (ASTM A 570) construction, continuous mitered and welded corner seams, integral base plate (not cant), and factory installed treated wood nailer and shall be insulated with 1-1/2" thick rigid fiberglass board insulation. Provide tapered units as required to compensate for roof deck slopes. Coordinate dimensions and loading requirements with data for equipment to be supported.
 - 1. Curb shall bear on structural members (beams), not deck, and be of sufficient strength to carry the uniform and reaction concentrated load of the equipment being supported. Curb shall be designed to span between beams as shown on the Drawings.

2.05 PREFABRICATED COWL TYPE PIPE CURBS

- A. Provide pipe curbs equal to RPPC-90 by Roof Products Ins or equal by The Pate Company, Custom Curb, Inc., or Thybar Corp. as required for type of roof construction. Pipe curbs shall be constructed of heavy gauge structural quality galvanized steel (ASTM A 570) with continuous welded corner seams, integral base plate (not cant), factory installed treated wood nailer and shall be insulated with 1-1/2" thick rigid fiberglass board insulation with three (3) sided galvanized steel chase with removable watertight cover attached to curb. Field cut inside enclosure for piping

2.06 PREFABRICATED PIPE CURBS

- A. Provide pipe curbs as manufactured by The Pate Company, Custom Curb, Inc., or Thybar Corp. as required for type of roof construction. Pipe curbs shall be constructed of heavy gauge structural quality galvanized steel (ASTM A 570) with continuous welded corner seams, integral base plate (not cant), factory installed treated wood nailer and shall be insulated with 1-1/2" thick rigid fiberglass board insulation. Counterflashing cap shall be acrylic clad abs thermoplastic including graduated step neoprene boots, adjustable stainless steel clamps and cap fastening screws.

2.07 PREFABRICATED PIPE ROLLER SUPPORTS

- A. Provide pipe supports as manufactured by The Pate Company, Custom Curb, Inc., or Thybar Corp. as required for type of roof construction. Pipe supports shall be constructed of heavy gauge structural quality galvanized steel (ASTM A 570) with continuous welded corner

seams, integral base plate (not cant), factory installed treated wood nailer and shall be insulated with 1-1/2" thick rigid fiberglass board insulation.

1. Pipe roller supports shall provide several inches of both vertical and horizontal adjustment to allow for variation in roof elevation and pipe location. Pipe roller shall be painted with rust inhibitive paint. Roller assembly shall contain positive locking devices to maintain pipe location providing all fittings are tightened to a torque of 40 ft.-lb.

2.08 WALKWAY PROTECTION BOARDS

- A. Mineral surfaced bituminous composition board, 1/2" thick, manufactured specifically for embedment in roofing specified as protection of roofing against occasional foot traffic.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck surfaces are dry.

3.02 INSTALLATION

- A. General: Comply with manufacturer's printed 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.
 1. Except as otherwise indicated, install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual".
- B. Isolation: Where metal surfaces of units are to be installed in contact with non-compatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement, to form a seal.
- D. Cap Flashing: Where cap, flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- E. Operational Units: Test operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.
- F. Provide for thermal expansion in the installation of continuous-run accessory items, wherever the run is more than 15 ft. in length.

- G. Composition Board Type Walkways: Provide walkway protection boards at the locations shown, using units of the size shown.

- 1. Flood coat and aggregate surfacing shall be completed. Sweep walkway area clear of loose aggregate. Set walkway boards in hot bitumen on top of the surfacing aggregate.

3.03 MISCELLANEOUS FLASHINGS AND ACCESSORIES

- A. Comply with manufacturer's printed instructions and recommendations. Coordinate with installation of substrates to receive accessory units, 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.

- 1. Except as otherwise indicated, install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual."

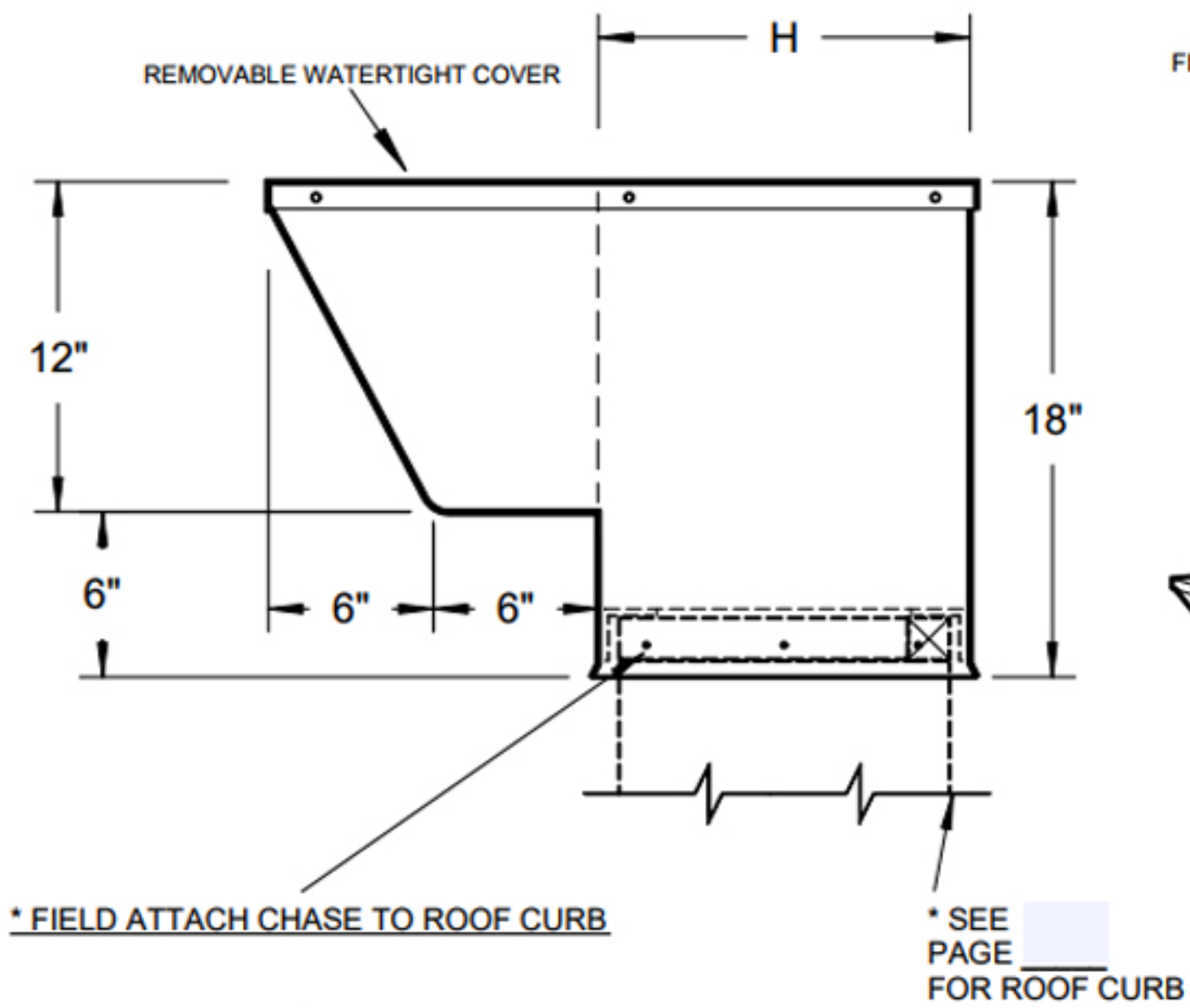
3.04 CLEANING

- A. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

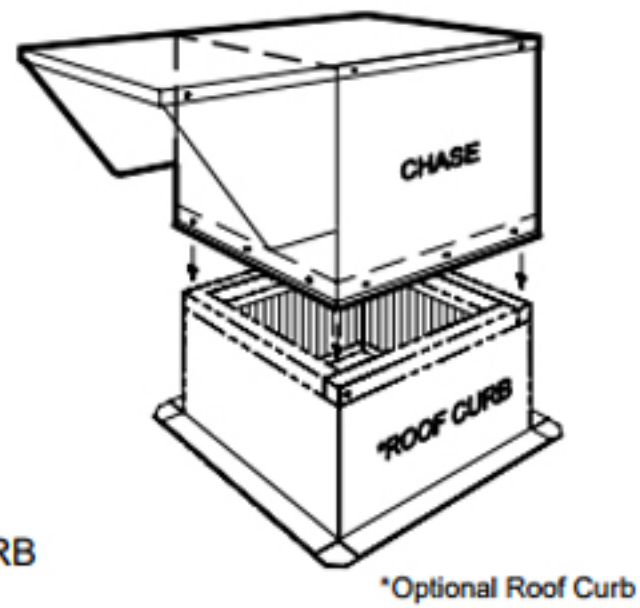
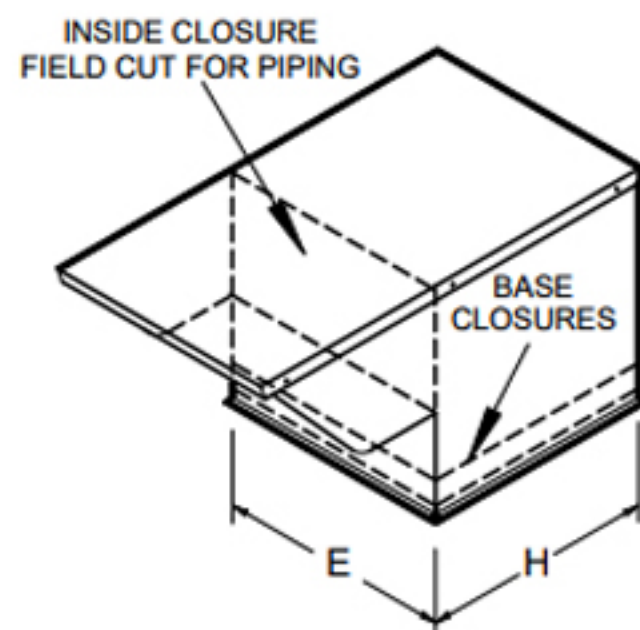
3.05 PROTECTION

- A. Protect building surfaces against damage from roofing work.

END OF SECTION



SIDE ELEVATION



ISOMETRIC VIEW

JOINT SEALERS**SECTION 07900****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Preparing substrate surfaces.
- B. Sealant and joint backing for walls, joints, paving joints, etc. Also, preformed compressible joint sealers at penetrations where indicated on the drawings.
- C. 2 Hour fire rated Expansion Joints where indicated on the drawings

1.02 RELATED SECTIONS

- A. Section 07270 - Firestopping: Sealants required in conjunction with firestopping.
- B. Section 07600 - Roofing and Sheet Metal: Sealants required in conjunction with roofing and flashing.
- C. Section 08800 and 08900 - Glazing: Sealants required in conjunction with glazing methods.

1.03 REFERENCES

- A. ASTM C790 - Use of Latex Sealing Compounds.
- B. ASTM C804 - Use of Solvent-Release Type Sealants.
- C. ASTM C834 - Latex Sealing Compounds.
- D. ASTM C920 - Elastomeric Joint Sealants.
- E. ASTM C962 - Use of Elastomeric Joint Sealers.
- F. ASTM C1193 - Guide for Use of Joint Sealants.
- G. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations and color availability.
- C. Samples: Submit two samples, 1/2" x 3" inch in size illustrating sealant colors for selection.

- D. **Manufacturer's Installation Instructions:** Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.
- E. **Test Reports:** Submit the following test reports by the sealant manufacturer:
 - 1. Compatibility and adhesion test reports indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
 - 2. Preconstruction joint sealer-substrate test results including recommendations of joint sealer manufacturer for joint preparation and application of joint sealers applicable to project conditions.
 - 3. Certified test reports for elastomeric sealants evidencing compliance with requirements specified based on comprehensive testing of current product formulations within a 24-month period of preceding date of submission of test reports to Architect. Include test results for aged performances including hardness, stain resistance, adhesion and cohesion under cyclic movement (ASTM C719), low-temperature flexibility, modulus of elasticity at 100% strain, effects of heat aging, and effects of accelerated weathering.
 - 4. Preconstruction field test results reported by Installer indicating which products and joint preparation methods demonstrated acceptable adhesion to joint substrates.
- F. **Certificates:** Submit certificates from manufacturers of joint sealers attesting that their products comply with specification requirements, are compatible with all materials in contact with joint backers and sealants, and will not bleed into adjacent surfaces, and are suitable for the use indicated.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants for exterior applications that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates and adjacent surfaces.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain air tight continuous seals that are water resistant and cause no staining or deterioration of joint substrates and adjacent surfaces.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Maintain copies of each document on site.
- C. **Single Source Responsibility:** Obtain joint sealer materials from a single manufacturer for each different product required.
- D. **Testing Laboratory Qualifications:** To qualify for acceptance, an independent testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the work.

1. All cost of testing laboratory services shall be borne by the Contractor.
- E. Preconstruction Compatibility and Adhesion Tests: Submit substrate materials representative of actual joint surfaces to be sealed to manufacturer of joint sealer products for laboratory testing of sealants for adhesion to primed and unprimed substrates and for compatibility with secondary seals, if required, as indicated below:
1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealers to joint substrates under environmental conditions that will exist during actual installation.
 2. Submit not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.
 4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
- F. Preconstruction Field Tests: Prior to installation of joint sealants, field-test adhesion to joint substrates as follows:
1. Install joint sealants in 5-foot joint lengths using same materials and methods required for completed work. Allow sealants to cure before testing. Test adhesion to joint substrates by manually trying to pull joint sealant out of joint.
 - a. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 3 inch cuts. Place a mark 1 inch from top of 2 inch piece.
 - b. Use fingers to grasp 2 inch piece of sealant just above 1 inch mark; pull firmly down at a 90 degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 2. Locate test joints where indicated or, if not indicated, as directed by Architect.
 3. Perform field tests for each application as follows:
 - a. Each type of elastomeric sealant and joint substrate application indicated.
 - b. Perform tests in Architect's presence.
 4. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 5. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- G. Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to the following selected building joint as indicated below for further verification of colors selected from sample submittals and to represent completed work for qualities of appearance, materials and applications.

1. Joints in field-constructed mock-ups of assemblies specified in other sections which are indicated to receive elastomeric joint sealants as work of this section.
2. Retain mock-up during construction as standard for judging completed work.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience and approved by manufacturer.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 COORDINATION

- A. Coordinate work.
- B. Coordinate the work with all sections referencing this section.

1.10 WARRANTY

- A. Provide five (5) year labor warranty and twenty (20) year material warranty under provisions of Section 01400.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve water tight seal or exhibit loss of adhesion or cohesion, or do not cure.

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

- A. Colors: For exposed materials, provide color as selected by Architect from manufacturer's standard colors. For concealed materials, provide the natural color which has the best overall performance characteristics.
- B. Compatibility: Before purchase of each required material, confirm its compatibility with each other material it will be exposed to and be in contact with in the joint system.
- C. Size and Shape of Joint: As shown, or if not shown, as recommended by the manufacturer for the type and condition of joint, and for the indicated joint performance or movement.

2.02 SEALANTS

- A. Silicone Elastomeric Sealant : One-Part Neutral-Curing, ASTM C 920, Type S; Grade NS, Class 25; Uses NT, G, A, and O as applicable to uses indicated, $\pm$ 50% movement capability after 5 years, and complying with requirements for medium modulus as required for indicated application and recommended by the manufacturer.

1. 756, 790; Dow Corning
2. SCS2000, SCS2700; G.E.
3. 890, 895; Pecora Corp.
4. Spectrum 1/2; Tremco

NOTE: Sealant must be tested and certified in writing not to stain or discolor adjacent surfaces.

- B. Polyurethane Sealant (**Type B**): ASTM C920, Type S, Grade NS, Class 25, Use NT, M, A and O, single component, chemical curing, non-staining, non-bleeding, non-sagging:
1. Sikaflex-la; Sika Chemical Corp.
 2. Sonolastic, NPI; Sonneborn/Contech, Inc.
 3. Dymonic; Tremco
 4. Vulken 921; Mameco International, Inc.
- C. Polyurethane Sealant (**Type C**): ASTM C920, Grade P/NS, Class 25, Type M/S; multi-component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, self-leveling type:
1. TCH-900/901; Tremco
 2. Chem-Calk 550; Woodmont Products, Inc.
 3. Sonolastic Pavement Joint Sealer; Sonneborn/Contech, Inc.
 4. NR-200 Urexpan; Pecora Chemical Co.
 5. Vulken 245; Mameco International, Inc.
- D. Butyl Sealant (**Type D**): ASTM C920, Grade single component, solvent release, non-skinning, non-sagging:
1. Elongation Capability 7 to 10 percent
 2. Service Temperature Range -13 to 180 degrees F.
 3. Shore A Hardness Range 10 to 30
- E. Acrylic Emulsion Latex (**Type E**): ASTM C834, single component:
1. AC20 Acrylic Latex Caulk; Pecora Chemical Co.
 2. Latex Caulk; DAP
 3. Chem-Calk 600; Woodmont Products, Inc.
 4. Acrylic Latex Caulk; Tremco
- F. Silicone Sanitary Sealant (**Type F**): ASTM C920, Grade P/NS, Class 25, single component, solvent curing, non-sagging, non-staining, fungus/mildew resistant, non bleeding.
1. Sanitary 1700; G.E.
 2. Dowsil™786 Silicone Sealant

2.03 PREFORMED COMPRESSIBLE JOINT SEALER

- A. Permanently elastic, high density, open-cell polyurethane foam, impregnated with water based polymer modified asphalt, compressed to approximately 25% of its uncompressed form dimension. Equal to 25V by Emseal corp.
- B. 2 Hour fire rated Expansion Joints: Silicone faced intumescent bellows factory applied to fire retardant impregnated foam; movement capability: +25%, -25% (50% total), UL-certified fire barrier. Equal to EMSHIELD WFR2 by Sika. and MM Systems and Schul International Co

2.04 ACCESSORIES

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM C962; round, closed cell, non absorbent to liquid water and gas, non-outgassing polyethylene foam rod; acceptable to the manufacturer, oversized 30 to 50 percent larger than joint width equal to:
 - 1. Ethofoam by Dow Chemical Co.
 - 2. Minicel by Haveq Industries
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- E. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Perform preparation in accordance with manufacturer's instructions.
- B. Immediately before installing sealants remove loose materials and foreign matter which might impair adhesion of sealant.

- C. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Protect elements surrounding the work of this section from damage or disfiguration.
 - 1. Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION

- A. Install sealant in accordance with manufacturer's printed instructions and ASTM C 1193.
- B. Measure joint dimensions and size materials to achieve width/depth ratios recommended by the manufacturer.
- C. Install backer rods of type indicated to provide support of sealants during application and at a position required to product uniform cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability. All joints shall be used 25 - 30% under compression.
 - 1. Do not leave gaps between ends of joint fillers.
 - 2. Do not stretch, twist, puncture, or tear joint fillers.
 - 3. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
- D. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly and when backer rod cannot be implemented.
- E. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer.
- F. Apply sealant with sufficient pressure to completely fill the void space and to assure complete wetting of contact area to obtain uniform adhesion. During the application, keep the tip of nozzle at the bottom of joint, forcing sealant to fill from bottom to top. Move tip along joint at a rate as to completely fill the joint.
- G. Install sealant free of air pockets, foreign embedded matter, ridges and sags.
- H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- I. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.04 CLEANING

- A. Clean work under provisions of 01700.
- B. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Section 01500.
- B. Protect sealants until cured.

3.06 SCHEDULE

- A. **Sealant Type A:** as follows:
 1. Exterior Openings: Caulk perimeter joints of exterior openings, such as doors, louvers, windows, penetrations, etc. and all penetrations to exclude water, i.e., outlet boxes, fixture attachments, etc
 2. Exterior Wall/Soffit Joints: Caulk all joints in exterior wall and soffit construction.
- B. **Sealant Type B:** As follows:
 1. Interior Joints: Caulk all interior joints 3/8" wide or more.
 2. Flashing at Roof: See section 07500, caulk all joints.
- C. **Sealant Type C:** As follows:
 1. Expansion Joints: Caulk all expansion joints of traffic-bearing decorative paving including exterior decorative paving where indicated "sealant" on the Drawings.
- D. **Sealant Type D:** As follows:
 1. Thresholds: Set thresholds in bed of sealant; where thresholds have weep holes, keep the weep clear and remove excess sealant.
- E. **Interior Caulking Type E:** As follows:
 1. Door Frames: Caulk perimeter joints of metal frames.
 2. Joints: Caulk all joints 1/4" wide or less, except use Type B sealant at joints 3/8" wide or more.
- F. **Interior Sealant Type F:** As follows:
 1. Caulk at all plumbing fixtures and countertops in "wet areas" contact with wall construction.
 2. Expansion joints in tile finish.
- G. **Preformed Compressible Sealer:** As follows:
 1. At duct penetrations at exterior walls and other locations indicated on the drawings.

END OF SECTION

STEEL DOORS AND FRAMES**SECTION 08112****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Steel doors and frames; interior and exterior, and frames for glazing; paint finish.

1.02 RELATED SECTIONS

- A. Section 08710 - Door Hardware
- B. Section 08800 - Glazing
- C. Section 09900 - Painting: Field painting of doors

1.03 REFERENCES

- A. ANSI A117.1 - Specifications for Making Building and Facilities Accessible to an Usable by Physically Handicapped People
- B. ANSI/SDI-100 - Standard Steel Doors and Frames
- C. ASTM A224.1 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces.
- D. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- E. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware
- F. ASTM E152 - Methods of Fire Tests of Door Assemblies
- G. NFPA 80 - Fire Doors and Windows
- H. NFPA 252 - Fire Tests for Door Assemblies
- I. UL 10B - Fire Tests of Door Assemblies
- J. U.S. Department of State, Bureau of Diplomatic Security; SD-STD-01.01, Revision G Amended April 30, 1993

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300
- B. Product Data: Indicate frame configuration, anchor types and spacings, location of cut-outs for hardware, reinforcement.
- C. Manufacturer's Installation Instructions: Indicate special installation instructions.

- D. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, louvers, and finish.
- E. LEED Submittals: Submit data documenting LEED credits applicable to herein specified products that qualify for credit categories specified in Section 01352- LEED Requirements

1.05 QUALITY ASSURANCE

- A. Conform to requirements of ANSI/SDI-100 by the Steel Door Institute and ANSI A117.1.
- B. Maintain one copy of each document on site.
- C. Exterior doors and frames shall comply with IBC code requirement for wind loads indicated on the drawings, and have labels affixed showing testing and compliance. Also, doors and frames shall comply with the large missile impact criteria per requirements of SBCCI SSTD-12, and ASTM E1886 and E1996.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.07 REGULATORY REQUIREMENTS

- A. Fire Rated Construction: Conform to ASTM E152, NFPA 252 or UL 10B.
- B. Installed Assembly: Conform to NFPA 80 for fire rated class as scheduled.
- C. Stairwell Doors/Frames: all side-hinged or pivoted swinging fire doors to be tested per NFPA 252 or UL 10C. These tests are "positive-pressure" tests per Section 714 in IBC code. Rate of rise of 250° F across door thickness at stairwells

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Accept doors and frames on site in manufacturer's packaging. Inspect for damage.

1.08 COORDINATION

- A. Coordinate the work with frame opening construction, door and hardware installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Steelcraft Manufacturing Company
- B. Republic Steel Corporation
- C. Amweld Building Products Division

- D. Ceco Industries, Medallion Design
- E. Curries
- F. Amertex
- G. Pioneer Industries, Inc.
- H. Steward Steel, Inc

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets: Commercial quality carbon steel, pickled and oiled, complying with ASTM A1011 and ASTM A568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A1008 and ASTM A568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A924 and ASTM A653, with ASTM A525 G90 zinc coating, mill phosphatized for preparation of paint coating.
- D. Supports and Anchors: Fabricate of not less than 18 gage galvanized sheet steel.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, complying with ASTM A153, Class C or D as applicable.
- F. Shop Applied Paint: Rust-inhibitive primer, either air-drying or baking, suitable as a base for specified finish paints.

2.03 FRAMES

- A. Exterior Frames: 14 gauge thick galvanized steel material, base metal thickness fully welded frame units.
- B. Interior Frames: 16 gauge thick cold-rolled or hot-rolled steel material, base metal thickness fully welded frame units.
- C. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

- D. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- E. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.04 DOORS

- A. Exterior Doors: SDI-100 Level 3, (Extra Heavy Duty) Model 2 (Seamless Design) of galvanized steel.
- B. Interior Doors (Non-rated): SDI-100 Level 3, (Extra Heavy Duty) Model 2 (Seamless Design) of cold-rolled steel.
- C. Interior Doors (Fire Rated): SDI-100 Level 3, (Extra Heavy Duty) Model 2 (Seamless Design) of cold-rolled steel.
- D. Face: Steel sheet in accordance with ANSI/SDI 100 but not less than 16 gauge; stainless steel where indicated.
- E. Core: 20 gage steel channel vertical steel stiffeners at 6" o.c. with noncombustible insulation solidly packed between steel members or solid spray polyurethane foam insulation core per ANSI A250.8, Section 2.3.2 at exterior locations, and manufacturers standard noncombustible honeycomb core at interior locations.

2.05 ACCESSORIES

- A. Silencers: Resilient rubber fitted into drilled hole.

2.06 FABRICATION

- A. Fabricate frames as a single welded unit.
 - 1. Knock down frames are not acceptable.
- B. Fabricate frames with hardware reinforcement plates welded in place.
- C. Fabricate doors with hardware reinforcement welded in place.
- D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- E. Prepare frame for silencers. Provide three single silencers for single doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- F. Door shall be 1-3/4" thick unless otherwise indicated.
- G. Astragals for double doors: Steel, T-shaped, specifically for double doors.
- H. Close top edge of exterior doors with flush end closure. Seal joints watertight.

- I. Door faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to provide a smooth flush surface.
- J. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
- K. Louvers: Shall be inverted "V" blade, sightproof type, unless noted otherwise. Galvanized at exterior locations

2.07 HARDWARE PREPARATION

- A. Mortise Hardware Preparation: Reinforce, drill and tap doors and frames to receive mortised hinges, locks, latches, flush bolts and concealed door closers as required. Preparation shall be in accordance with applicable requirements of ANSI A115.
- B. Surface Applied Hardware: Field drilling and/or tapping for surface applied hardware by others is standard.
- C. Reinforcings: Provide minimum hardware reinforcing gages as noted in SDI-107.
- D. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.

2.08 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 0 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames

2.08 NOMINAL DESIGN CLEARANCES

- A. The nominal clearance between the door and frame head and jamb s shall be 1/8" in the case of both single swing and pairs of doors.
- B. The nominal clearance between the meeting edges of pairs of doors can range from 1/8" to 1/4" (1/8" for fire rated doors).
- C. The nominal clearance at the bottom shall be 3/4".
- D. The nominal clearance between the face of the door and door stop shall be 1/16".
- E. All clearances are subject to a tolerance of + or - 1/32".

2.09 STEEL SHEET FINISH

- A. Doors and frames leading to the exterior shall be galvanized in accordance with ASTM A525 G60.
- B. Primer: Air dried or baked complying with requirements for acceptance stated in ANSI A224.1 with minimum 1.2 dry mil thickness. Doors and frames shall be thoroughly cleaned, and chemically treated to insure maximum paint adhesion. All surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air-dried or baked-on. The finish shall meet the requirements for acceptance stated in ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

- A. Install doors and frames in accordance with ANSI/SDI-100 and DHI.
- B. Place frames in accordance with SDI-105 "Recommended Erection Instructions for Steel Frames", with a minimum of three (3) wall anchors per at hinge and strike levels and four (4) anchors for frames over 7'-6" in height.
- C. Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. Doors shall be adjusted to maintain perimeter clearances specified. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved
- D. Coordinate installation of doors and frames with installation of hardware specified in Section 08710.
- E. Coordinate with glass and glazing.
- F. Install fire rated assemblies in accordance with NFPA 80.

3.03 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust door for smooth and balanced door movement.

END OF SECTION

WOOD DOORS**SECTION 08200****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Interior flush solid core wood doors for transparent finish.
- B. Factory finishing of all doors and frames.
- C. Factory prefit and premachine doors.
- D. Fire Rated assemblies where indicated.

1.02 RELATED SECTIONS

- A. Section 08112 - Steel Frames
- B. Section 08710 - Door Hardware

1.03 REFERENCES

- A. AWI - Quality Standards of the Architectural Woodwork Institute.
- B. ASTM E152 - Methods of Fire Tests of Door Assemblies.
- C. NFPA 80 - Fire Doors and Windows.
- D. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.
- E. UL 10B - Fire Tests of Door Assemblies.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Illustrate door opening criteria, sizes, types, swings, special blocking for hardware, identify cutouts for glazing.
- C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics and factory finishing criteria.
- D. Manufacturer's installation Instructions: Indicate special installation instructions, if any.
- E. Samples: Wood veneers illustrating wood grain, stain color and sheen.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Quality Standard, Section 1300.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products.
- B. Package, deliver and store doors in accordance with AWI Standard.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.08 COORDINATION

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.09 REGULATORY REQUIREMENTS

- A. Fire Rated Construction: Conform to ASTM E152, NFPA 252 or UL 10B.
- B. Installed Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.10 WARRANTY

- A. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42 by 84 inch (1067 by 2134 mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch (0.25 mm in a 75 mm) span, or do not conform to tolerance limitations of referenced quality standards.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 - 2. Warranty shall be in effect during the following period of time after date of Substantial Completion: Life of Installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Masonite Architectural
- B. Buell Doors
- C. IPIK Door Company
- D. Marshfield (Weyerhaeuser Company, Inc.).
- E. GPD PC5 by Graham
- F. VT Industries

2.02 FLUSH DOORS

- A. Flush Interior Doors: 1³/₄ inches thick; solid core construction.
- B. Construction (Non fire rated): AWI Section 1300, Type PC-5 with 1³/₈" vertical stiles and 1³/₄" top and bottom rails glued securely to core parts; no voids or finger joint material allowed.
 - 1. Stile edge screw withdrawals when tested in accordance with ASTM D-1037-78 shall exceed 740 lbs. and VA 08210-TM shall exceed 700 lbs.
 - 2. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- C. Particle Board Core: Conform to ANSI standard A208.1-1989 Grade 1-LD-2 covering material formed particle board with face screw holding of 125 pounds, modulus of rupture of 800 psi, modulus of elasticity of 150,000 psi, and density of 32 pounds per cubic foot.
- D. Crossbands: Hardwood or synthetic crossbands and faces shall be laminated to the core with glue by the hot press process.
- E. Veneer Facing (Transparent Finish): AWI Premium quality species wood, as follows for transparent finish with book matched or slip match veneers to prevent dark/light striping affect of adjacent flitches, minimum 1/32" thick before sanding at 12% moisture content.
 - 1. Species White Oak, plain sliced.
 - 2. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.
 - 3. Transoms and Doors: End match
- F. Adhesive: Water resistance except Type I - waterproof at face veneers.
- G. Fire Rated Door (45 min. and higher): Constructed as above except with inert mineral core, minimum 1/2" top rail, minimum 1¹/₄" bottom rail and 5" reinforcement header at closers. side-hinged or pivoted swinging fire doors to be tested per NFPA 252 or UL 10C

2.03 FABRICATION

- A. Fabricate doors in accordance with AWI Quality Standards.
- B. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - 1. Comply with tolerance requirements of AWI for prefitting and as follows:
 - a. 1/8" on top, hinge and lock edges.
 - b. 1/8" at meeting edges on paired doors.
 - c. Bevel both edges 1/8" in 2".

2. Coordinate measurements of hardware mortises in frames to verify dimensions and alignment before proceeding with factory premachining. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
- C. Vertical exposed Edge of Stiles: Of same species as veneer facing for transparent finish.
- D. Fit door edge trim to edge of stiles after applying veneer facing.
- E. Bond edge banding to cores.
- F. At double doors continue sequence of matching veneers across the face of both doors.
- G. Provide additional solid blocking at stiles and rails for hardware reinforcement for hinges, closers and lockset/latchsets.
- H. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL requirements.

2.04 FACTORY FINISHING (TRANSPARENT FINISH)

- A. Factory finish wood doors in accordance with AWI - Section 1500 System TR-4, Conversion Varnish, nonyellowing alkyd based, as follows to provide a satin-medium rubbed effect 10° - 20°.
 1. Sand (100 - 200 grit stearated paper)
 2. Washcoat (conversion varnish reduced)
 3. Stain (to match Architects sample, VT "Riverstone" R119)
 4. Sealer (conversion varnish reduced)
 5. Sand (220 grit stearated paper)
 6. Topcoat
 7. Topcoat

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes and tolerances are acceptable.
- B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with AWI Quality Standard.
 1. Comply with NFPA 80 at fire rated doors.
- B. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
- C. Pilot drill screw and bolt holes.
- D. Machine cut for hardware. Core for handsets and cylinders.

- E. Coordinate installation of doors with installation of frames specified in Division 8 and hardware specified in Section 08710.

3.03 INSTALLATION TOLERANCES

- A. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 x 84 inch surface area.
- B. Maximum Vertical Distortion (Bow): 1/8" measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inch surface area.
- C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inch surface area.

3.04 ADJUSTING

- A. Adjust work.
- B. Adjust door for smooth and balanced door movement.

END OF SECTION

ACCESS DOORS**SECTION 08305****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Steel access doors.
- B. Provide fire rated doors when penetrating fire rated construction.

1.02 RELATED WORK

- A. Painting of Access Doors: Section 09900, Painting

1.03 FIRE RATING CLASSIFICATION

- A. Fire rated access doors shall bear the Underwriters Laboratories, Inc., 1-1/2 hour "B" Label (250 degrees rating).

1.04 SUBMITTALS

- A. In accordance with Section 01300.
- B. Shop Drawings:
 - Access doors, each type, showing construction, location and installation details.
- C. Manufacturer's Literature and Data:
 - Access doors, each type.

1.05 APPLICABLE PUBLICATIONS

- A. The National Association of Architectural Metal Manufacturers (NAAMM):
 - Metal Finishes Manual (August, 1969)

PART 2 - PRODUCTS**2.01 FABRICATION, GENERAL**

- A. Fabricate components so as to be straight, square, flat and in same plane where required. Slightly round exposed edges and provide access without burrs, snags and sharp edges. Welds where exposed shall be continuous and ground smooth.
- B. Number of locks and non-continuous hinges shall be as required to maintain alignment of panel with frame, except for fire rated doors, the number shall be the same as required by the

fire test.

- C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors as required to secure access door in opening and as required by fire test.

2.02 ACCESS DOORS, FIRE RATED

- A. Door Panel: Form of 0.0359 inch thick galvanized steel sheet, insulated sandwich type construction.
- B. Frame: Form of 0.0598 inch thick galvanized steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete and masonry openings. Weld exposed joints in flange and grind smooth.
- C. Automatic Closing Device: Provide automatic closing device for each door.
- D. Hinge: Continuous steel hinge with stainless steel pin.
- E. Lock: Self-latching, with provision for fitting flush a standard screw-in type lock cylinder. Lock cylinder is specified in Section 08710- Hardware. Provide latch release device operable from inside of door. Mortise lock case in door.

2.03 ACCESS DOORS, FLUSH PANEL

- A. Door Panel: Form of 0.0747 inch thick galvanized steel sheet. Reinforce as required to maintain flat surface.
- B. Frame: Form of 0.0598 inch thick galvanized steel sheet of depth and configuration to suit material and type of construction where installed and to align flush with surrounding construction. Provide surface mounted units having frame flange at perimeter where installed in concrete or masonry construction. Weld exposed joints in flange and grind smooth.
 - 1. At drywall construction provide perforated portion of frame with bead for joint treatment flush with face of gypsum board; overlapping flange is not permitted.
- C. Hinge: Concealed spring hinge to allow panel to open 175 degrees. Provide removable hinge pin to allow removal of panel from frame.
- D. Lock: Flush, screw driver operated cam lock.

2.04 FINISH

- A. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.

2.05 SIZE

- A. Access doors shall be minimum 12 inches, unless otherwise shown.

PART 3 - EXECUTION

3.01 LOCATION

- A. Provide access panels or doors wherever any valves, traps, air splitter dampers, cleanouts and other control items of mechanical, and electrical work are concealed in wall, partition or ceiling construction.

3.02 INSTALLATION, GENERAL

- A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling grid or side walls when installed in ceiling. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.

3.03 ANCHORAGE

- A. Secure frames to adjacent construction using anchors attached to the frames or by use of bolts or screws through the frame members. Type, size and number of anchoring device shall be suitable for the material surrounding the opening, and as required to maintain alignment and resist displacement during normal use of the access door and the building.

1. Anchors for fire rated access doors shall be as required by the fire test.

3.04 ADJUSTMENT

- A. Adjust hardware so that the door panel will open freely, and when closed the door panel will be centered within the frame.

END OF SECTION

OVERHEAD DOOR

SECTION 08360

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum full view sectional vertical lift glazed overhead door.
- B. Electric Door Operator

1.2 RELATED SECTIONS

- A. 05500 - Metal Fabrications.
- B. 06100 - Rough Carpentry.
- C. 07900 - Joint Seals.
- D. 08710 - Door Hardware and locks.
- E. Div 16 - Electrical service and connections for powered operators.

1.3 REFERENCES

- A. ASTM B 653/653M
- B. ASTM B 209/209M
- C. ASTM B 221/221M
- D. AAMA 2604
- E. DASMA TDS-163
- F. ANSI/DASMA 102

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Operation and maintenance data.
 - 5. Nameplate data and ratings for motors.
- C. Shop Drawings: Include opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Selection Samples: Upon request furnish color samples or 2' X 2' section sample

1.5 WIND AND IMPACT PERFORMANCE REQUIREMENTS

- A. Design doors to withstand a minimum 46 psf design wind load; 69 psf test wind load, both positive and negative, with impact rated glazing to meet building code requirements.
- B. Glass framing and glass shall meet Large Missile Impact criteria per requirements of SBCCI SST-12, and ASTM E1886 and E1996, meeting requirements of the Missile Test of ASTM E 1996, with required silicone sealant glass installation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum ten years of documented experience.
- B. Installer Qualifications: Minimum five years of documented experience, and authorized by the door manufacturer.

1.7 WARRANTY

- A. Manufacturers Limited Warranty aluminum sectional overhead doors.
- B. Standard finish warranty against cracking, checking, or peeling for 5 years.
Parts and Hardware for 1 year

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Clopay Corporation: 8585 Duke Blvd.; Mason, OH 45040; <https://www.clopaydoor.com>
- B. Basis of Design: Model 904 by Clopay or equal by Cornell and Cookson.

2.1 ARCHITECTURAL SERIES GLAZED ALUMINUM SECTIONAL OVERHEAD DOOR

- A. Door Construction:
 - 1. Panel Sections: 2-1/8 inches (54 mm) thick extruded 6053-T5 aluminum.
- B. Heavy Duty 2.125 inches (54 mm) Door - Clopay Model 904:
 - 1. Maximum Door Size: 16 ft, 2 inches by 18 feet high.
 - 2. Windows:
 - a. Glazing thickness
 - 1. 5/16 inch Low-E coated Laminated with .09 thick interlayer, large missile Impact rated
 - b. Glazing type
 - 1. Low-E coated Laminated, Solarban 70 (2) Solarbronze + Clear Glass by Vitro, large missile Impact rated
 - 3. Aluminum Finish:
 - a. Class I Color Anodized Finish: AA-M12C22A42/A44 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color) complying with AAMA 611.
Color: Dark Bronze anodized
 - 4. Locking: Inside spring loaded slide bolt lock on end stile that engages slot in track.
 - a. Provide two inside slide locks with motor cutout interlock switches.
 - 5. Weatherstripping: Provide complete perimeter seals.
 - 6. Track:
 - a. 3" full taper (75 mm) track designed for 3" diameter rollers. Vertical and horizontal tracks minimum 0.096 inch (2.43 mm) galvanized steel
 - b. Provide full vertical track configuration to maximize headroom available per plans
 - 7. Spring Counterbalance: Torsion spring counterbalance mechanism sized to weight of the door, with high strength galvanized aircraft cable with minimum 7 to 1 safety factor
 - a. Standard Cycle Spring: 10,000 cycle.

2.2 ELECTRIC DOOR OPERATORS

- A. General: Provide electric door operator provided by door manufacturer for door with operational life specified complete with electric motor and factory pre-wired motor controls, starter, gear-reduction unit, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation. Comply with NFPA 70.
 - 1. Solenoid-operated brake.
- B. Disconnect Device: Provide hand-operated disconnect or mechanism for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- C. Design operator so motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.
- D. Provide control equipment complying with NEMA ICS1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, AC or DC.
- E. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motor, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (.03m/s), without exceeding nameplate ratings or considering service factor.
 - 1. Type: Solid State.
 - 2. Type: Jackshaft.
 - 3. HP:
 - a. 3/4 hp.
 - 4. Power Characteristics:
 - a. 1 phase, 208V
 - 5. Service Factor:
 - a. NEMA MG 1.
 - 6. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
- F. Key Control Station: Provide momentary contact, Best cylinder key control station with “Stop” push button.
- G. Provide interior units, fully guarded, surface mounted, heavy-duty type, with general-purpose NEMA ICS 6 enclosure in one of the following types:
 - 1. Enclosure Type: Type 4.
- H. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
 - 1. Photo-electric control: Provide each motorized door with a photo-electric device that will stop and reverse the downward door travel if the light beam is broken or blocked. Device shall be:
 - a. NEMA Type 4.
- I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- J. Provide auxiliary chain hoist: for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine wall and overhead areas, including opening framing and blocking, with installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work in this Section.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. 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 overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
 - 1. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
 - 2. Fit and align assembly including hardware; level and plumb, to provide smooth operation

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

INTERIOR ALUMINUM ENTRANCES AND STOREFRONT**SECTION 08410****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum entrance doors and frames.
- B. Aluminum storefront.
- C. Door hardware.

1.02 REFERENCES

- A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. AAMA - Curtain Wall Manual #10 - Care and Handling of Architectural Aluminum From Shop to Site.
- C. AAMA 501 - Methods of Test for Metal Curtain Walls.
- D. AAMA 603.8 - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
- E. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
- F. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.
- G. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- H. ANSI A117.1 - Safety Standards for the Handicapped.
- I. ANSI/ASTM A386 - Zinc Coating (Hot Dip) on Assembled Steel Products.
- J. ANSI/ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- K. ANSI/ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- L. ANSI/ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Shop Drawings: Submit for each aluminum entrance and storefront system required, including:
 - 1. System dimensions.
 - 2. Framed opening requirements and tolerances.
 - 3. Layout and installation details, including relationship to and inclusion of adjacent work.
 - 4. Elevations at 1/4 inch scale.
 - 5. Detail sections of typical composite members.
 - 6. Anchors and reinforcement.
 - 7. Hardware mounting heights.
 - 8. Provisions for expansion and contraction.
 - 9. Glazing details.
- C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware and internal drainage details.
- D. Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.
- E. Samples: Submit two samples 2 x 4 inches in size illustrating pre-finished aluminum surface.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. Conform to requirements of ANSI A117.1.
- C. Comply with requirements of the American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).

1.05 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience.

1.06 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.

- B. Handle work of this section in accordance with AAMA - Curtain Wall Manual #10.
- C. Protect pre-finished aluminum surfaces with wrapping or stripable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.010 WARRANTY

- A. Provide three year warranty under provisions of Section 01700.
- B. Warranty: Include coverage for complete system for failure to meet specified requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - ENTRANCE AND STOREFRONT AND PUNCHED WINDOWS

- A. Series Trifab 450 Flush Glazing System - Inside glazed with 350 medium stile doors by Kawneer or equal by U.S. Aluminum Corp. or and Vistawall.

2.02 MATERIALS

- A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper for doors, door frames, fixed glass sidelights, storefronts and transoms, T6 temper for extruded structural members.
- B. Sheet Aluminum: ANSI/ASTM B209; alloy and temper suitable for use.
- C. Fasteners: Non-magnetic stainless steel or aluminum or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components.
 - 1. Do not use exposed fasteners except where unavoidable for application of hardware.
 - 2. Provide any exposed fasteners with phillips flat head machine screws with finish to match finish of members and hardware being fastened.
- D. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.
- E. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool,

polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

2.03 COMPONENTS

- A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the exterior on all sides without projecting stops. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.
 - 1. Profile: 1-3/4" face by 4-1/2" deep for monolithic glass.
 - 2. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
- B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads.
- C. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with welded joints.
 - 1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum square glazing stops, with exterior stops anchored for nonremoval.
 - 2. Design: Provide 1-3/4 inch thick doors of design indicated.
 - a. Medium stile (3-1/2 inch nominal width for top and vertical stiles and 6-1/2 inch wide bottom rail).

2.04 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 08800 of Types described below:
 - 1. Glass in Storefront: 1/4" monolithic clear and also tempered spandrel glass (tempered for required safety glazed areas).
 - 2. Glass in Storefront Doors: 1/4" monolithic tempered clear glass.
- B. Gaskets: Manufacturer standard neoprene or EPDM wedge type gaskets produced for the specified framing system.

2.05 HARDWARE

- A. Hardware: Provide heavy-duty hardware units specified in Section 08710.door, including the

2.06 FABRICATION

- A. Fabricate components 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.
- E. Reinforce interior horizontal head rail to receive closer.
- F. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.
- G. Reinforce framing members for imposed loads.

2.07 FINISHES

- A. Baked Enamel Finish (Interior Locations): AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply powder coat or baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 2604 except with minimum dry film thickness of 1.5 mils, medium gloss.
 - a. Approved: "Duracron" by PPG.
 - 2. Color: equal to metal siding color-Centria "XL Silver - Sundance Series 9957.
- B. Exposed Aluminum Surfaces: AAMA A42 anodized to 0.7 mil thickness, prepared with a mechanical M12 and chemical C22 pre-treatment, anodized to black color

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining materials are ready to receive work of this Section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain

Wall, Window, Store Front and Entrance - Guide Specifications Manual.

- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Install hardware using templates provided.
- F. Install glass in accordance with to glazing method required to achieve performance criteria and referenced standards fro an airtight permanent installation.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Clean work under provisions of 01700.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Protect finished Work from damage.

END OF SECTION

EXTERIOR FIRE RATED CURTAINWALL SYSTEMS**SECTION 08412****PART 1 - GENERAL****1.1 SUMMARY****A. Section includes:**

1. Exterior fire rated factory painted aluminum face caps on steel frame and glazed system for installation at punched openings indicated on the drawings; 45 minute rated.

1.2 REFERENCES**A. American Architectural Manufacturers Association (AAMA)**

1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):

1. Fire safety related:
 - a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
2. Material related
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)

1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.

1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 251: Fire Tests of Building Construction & Materials
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):

1. UL 9: Fire Tests of Window Assemblies.
1. UL 10 B: Fire Tests of Door Assemblies
2. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies

3. UL 263: Fire tests of Building Construction and Materials
4. UL-752 Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300

B. Product Data:

1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:

1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure
2. Provide templates for the location of embeds and anchor locations required for any adjoining work (if applicable).

D. Samples for following products:

1. Glass sample-as provided by manufacturer
2. Sample of frame
3. Verification of sample of selected finish

- E. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

- F. Warranties: Submit manufacturer's warranty.

- G. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualifications according to

1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
2. International Accreditation Service for Testing Body-Building Materials and Systems
 - a. Fire Testing
 - 1) ASTM Standards E 119
 - 2) CPSC Standards 16 CFR 1201
 - 3) NFPA Standards 251, 252, 257
 - 4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
 - 5) BS 476; Part 22: 1987
 - 6) EN 1634-1
 - 7) CAN Standards S 101, S 104, S 106
- B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
- C. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.
- D. Regulatory Requirements: Comply with provisions of the following:
 1. Comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Accessible doors no more than 5 lbf (22.2 N) push or pull force
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction
- E. Structural: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as required by and calculated in accordance with the International Building Code 2021 and Supplements (Orleans Parish) and ASCE 7-16, measured in accordance with ANSI/ASTM E330 and when tested in accordance with ANSI/ASTM E330 as follows based on wind loads indicated on the S-series drawing and corners as defined in Code

Glass framing meeting missile impact criteria per requirements of SBCCI SSTD-12, and ASTM E1886 and E1996, meeting requirements of the Missile Test of ASTM E 1996, with required silicone sealant glass installation. Large – Missile Impact

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
 - 1. Note whether field or planned dimensions were used in the creation of the shop drawings.
- B. Coordinate the work of this section with others effected including but not limited to: other interior components and door hardware beyond that provided by this section

1.8 WARRANTY

- A. Provide the glass and frames manufacturer standard five-year manufacturer warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

- A. Manufacturer Glazing Material: Equal to “Pilkington Pyrostop®” fire-rated low-E coated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 (800-426-0279) fax (800-451-9857) e-mail sales@fireglass.com, web site <http://www.fireglass.com>
- B. Frame System: “Fireframes® Curtainwall Hurricane Series” fire-rated frame system (as required for indicated fire rating as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 (800-426-0279) e-mail sales@fireglass.com web site <http://www.fireglass.com> or GPX Architectural Series by Safti First Co.

2.2 PERFORMANCE REQUIREMENTS

- A. Frame System Description:
 - 1. Steel fire-rated glazed curtainwall system, dual aluminum cover cap format
 - a. Face width:
 - 1) 2”
 - b. Duration –Capable of providing a fire rating for 45 minutes.

2.3 MATERIALS - GLASS

- A. Fire Rated Glazing: 45-minute rated. Insulated units comprised of Pilkington “Pyrostop” fire-resistive rated glass and HVHZ glass for high velocity hurricane zone and large missile impact rating. **Glass to have Low-E coating to match the insulated glass specified in Section 08800**
- B. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).
- C. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

- D. Glazing Accessories: Manufacturer's standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

2.4 MATERIALS –ALUMINUM FRAMES

- A. Framing System - 45 min.
 - 1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
 - 2. Aluminum Caps/Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.
 - 3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - 4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - 5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.
 - 6. Glazing Gasket — Supplied with the steel framing members. Nom. 3/4 in. (19 mm) by 3/16 in. (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

2.6 FABRICATION

- A. Obtain reviewed shop drawings prior to fabrication.
- B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.
- C. Field glaze d frame assemblies.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish frames after assembly.
- C. Fluoropolymer Coating; Exterior Surfaces: High performance PVDF base color coating meeting AAMA 2605-11 and containing thermocuring polyvinylidene fluoride (70% solids by weight) supplied under license by manufacturers listed below with minimum rated service life of 20 years as published by the Manufacturer. Pre-treatment, epoxy primer, and finish coat(s) shall be factory baked-on of 1.0-1.5 dry mil thickness (minimum 0.2 dry mil primer and minimum 0.8 dry mil finish) with 2- coat system required for color.

1.Color: match metal siding color-Centria "XL Silver - Sundance Series 9957

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation are acceptable for product installation in accordance with manufacturer's instructions. Provide openings plumb, square and within allowable tolerances. The manufacturer recommends 3/8 inch shim space at all walls
- B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

- A. Install storefront and doors in strict accordance with manufacturers printed instructions.
- B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work

3.3 REPAIR AND TOUCH UP

- A. Powder Coated Finishes
 - 1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 - 2. Such repairs shall match original finish for quality or material and view.
 - 3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.6 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
 - 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 - 2. Do not use any of the following:
 - a. Steam jets
 - b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface

- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

INTERIOR FIRE RATED STOREFRONT SYSTEMS**SECTION 08415****PART 1 - GENERAL****1.1 SUMMARY****A. Section includes:**

1. Interior fire rated factory painted aluminum face caps on steel frame and glazed storefront system for installation at punched openings indicated on the drawings; 45 minute rated.

1.2 REFERENCES**A. American Architectural Manufacturers Association (AAMA)**

1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):

1. Fire safety related:
 - a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
2. Material related
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)

1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.

1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 251: Fire Tests of Building Construction & Materials
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):

1. UL 9: Fire Tests of Window Assemblies.
1. UL 10 B: Fire Tests of Door Assemblies

2. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
3. UL 263: Fire tests of Building Construction and Materials
4. UL-752 Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300

B. Product Data:

1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:

1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure
2. Provide templates for the location of embeds and anchor locations required for any adjoining work (if applicable).

D. Samples for following products:

1. Glass sample-as provided by manufacturer
2. Sample of frame
3. Verification of sample of selected finish

- E. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

- F. Warranties: Submit manufacturer's warranty.

- G. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualifications according to

1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
2. International Accreditation Service for Testing Body-Building Materials and Systems
 - a. Fire Testing
 - 1) ASTM Standards E 119
 - 2) CPSC Standards 16 CFR 1201
 - 3) NFPA Standards 251, 252, 257
 - 4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
 - 5) BS 476; Part 22: 1987
 - 6) EN 1634-1
 - 7) CAN Standards S 101, S 104, S 106
- B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
- C. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.
- D. Regulatory Requirements: Comply with provisions of the following:
 1. Comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Accessible doors no more than 5 lbf (22.2 N) push or pull force
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
 1. Note whether field or planned dimensions were used in the creation of the shop drawings.
- B. Coordinate the work of this section with others effected including but not limited to: other interior components and door hardware beyond that provided by this section

1.8 WARRANTY

- A. Provide the glass and frames manufacturer standard five-year manufacturer warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

- A. Manufacturer Glazing Material: Equal to “Pilkington Pyrostop®” fire-rated low-iron glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 (800-426-0279) fax (800-451-9857) e-mail sales@fireglass.com, web site <http://www.fireglass.com>
- B. Frame System: “Fireframes®” fire-rated frame storefront aluminum system (as required for indicated fire rating as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 (800-426-0279) e-mail sales@fireglass.com web site <http://www.fireglass.com> or GPX Architectural Series by Safti First Co.

2.2 PERFORMANCE REQUIREMENTS

- A. Frame System Description:
1. Steel fire-rated glazed curtainwall system, dual aluminum cover cap format
 - a. Face width:
 - 1) 2”
 - b. Duration –Capable of providing a fire rating for 45 minutes.

2.3 MATERIALS - GLASS

- B. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ low iron high visible glass laminated with an intumescent interlayer; 60-minute rated
- C. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).
- D. Properties Interior Glazing

Property				
Fire Rating	45 minute	60 minute		120 minute
Manufacturer’s designation	45-200	60-101	60-201	120-106
Glazing type	single	single	single	IGU
Nominal Thickness	3/4” (19mm)	7/8” (23mm)	1-1/16” (27mm)	2-1/4” (57mm)
Weight in lbs/sf	9.2	10.85	12.5	22.9
Daylight Transmission	86	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

- E. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

2.4 MATERIALS – FRAMES

- A. Framing System - 45 min.
 - 1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
 - 2. Aluminum Caps/Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.
 - 3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - 4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - 5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1” Pan Head Sheet Metal Screws for door installation.
 - 6. Glazing Gasket — Supplied with the steel framing members. Nom. 3/4 in. (19 mm) by 3/16 in. (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

2.6 FABRICATION

- A. Obtain reviewed shop drawings prior to fabrication.
- B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.
- C. Field glaze d frame assemblies.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish frames after assembly.
- C. Interior Aluminum Finishes
 - 1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
 - 2. Color and Gloss: color matching Centria “XL Silver - Sundance Series 9957”, semi-gloss.
 - 3. Acceptable Manufacturers:
 - a. Tiger Drylac
 - b. Additional manufacturers as approved by TGP

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation are acceptable for product installation in accordance with manufacturer's instructions. Provide openings plumb, square and within allowable tolerances. The manufacturer recommends 3/8 inch shim space at all walls
- B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

- A. Install storefront and doors in strict accordance with manufacturers printed instructions.
- B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work

3.3 REPAIR AND TOUCH UP

- A. Powder Coated Finishes
 - 1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 - 2. Such repairs shall match original finish for quality or material and view.
 - 3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.6 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
 - 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 - 2. Do not use any of the following:
 - a. Steam jets

- b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

DOOR HARDWARE**SECTION 08710****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 commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

- b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Hardware Supplier and Hardware Installer must obtain a license with the Louisiana Office of State Fire Marshall in accordance to RS 40:1464 and RS 40:1664.
- B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- C. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- D. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- E. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that

indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.

- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.
 - a. Pemko (PE).

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Pemko (PE) - SER-QC (# wires) Option.

- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

- a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

- a. Hager Companies (HA) - Quick Connect.
b. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. Rockwood (RO).

- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 - 1. Manufacturers:
 - a. Rockwood (RO).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 - 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 - 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 - 6. Manufacturers:
 - a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 - 1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA).
 - b. No Substitution.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Match Facility Standard.

- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
- F. Key Registration List (Biting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
 - 1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.7 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 8200 Series.

2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
12. Hurricane and Storm Shelter Compliance: Devices to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or storm shelter products that have been independently third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
2. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.

2.10 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. Sargent Manufacturing (SA) - 351 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood (RO).

2.12 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

- 1. Manufacturers:

- a. Rockwood (RO).

2.13 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

- 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

- 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

- F. Manufacturers:

- 1. Pemko (PE).

2.14 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

- a. Securitron (SU) - DPS Series.

- B. Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

- a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
 - b. Tolerates brownout or overvoltage input $\pm 15\%$ of nominal voltage.
 - c. Thermal shutdown protection with auto restart.
 - d. Circuit breaker protection against overcurrent and reverse battery faults.
 - e. Integrated battery charging circuit to prevent overvoltage on locking devices.
 - f. Available with a single relay fire trigger or individually triggered relayed outputs.
 - g. Monitoring options as specified.

2. Manufacturers:

- a. Securitron (SU) - AQD Series.

2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SA - SARGENT
4. RO - Rockwood
5. SU - Securitron
6. OT - Other

Set: 1.0

Doors: 100

Description: Exterior Alum Egress Pair - CVR/MELRxEO/RX - Door Pulls - Closer - DPS

2 Continuous Hinge	CFM__SLF-HD1 SER*		PE	⚡
1 Concealed Vert Rod Exit, Nightlatch	LC 55 56 AD8410 106 x 862	US32D	SA	⚡
1 Concealed Vert Rod Exit, Dummy	55 AD8410 862	US32D	SA	⚡
1 Cylinder	Match existing Yale			
2 Surface Closer	TB 351 CPS brkt/spacer as req	EN	SA	
2 Institutional Door Stop	462 EXP	US2C	RO	
1 Weatherstripping	By frame manufacturer		00	
2 Sweep	315CN		PE	
1 Threshold	2005AT		PE	
2 ElectroLynx Harness	QC-C1500P		MK	⚡
2 ElectroLynx Harness	QC-CxxxP		MK	⚡
2 Position Switch	DPS-BK		SU	⚡
1 Power Supply	AQDx size as req		SU	⚡
1 Cqrd Reader	By Security		OT	

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per aluminum door manufacturer. Confirm all hardware compatibility with aluminum storefront manufacturer.

Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

Set: 2.0Doors: [E-1](#), [S-1](#), [S-2](#)

Description: Single - Exterior - Exit Device-NL - Closer w/Stop Arm

1 Continuous Hinge	CFM HD1		PE
1 Rim Exit Device, NL	HC LC 8804 862	US32D	SA
1 Cylinder	Match existing Yale		
1 Surface Closer	TB 351 CPS brkt/spacer as req	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Gasketing	2891AS (head & jambs)		PE
1 Rain Guard	346C x Frame Width		PE
1 Sweep	345ANB x Dr. Width		PE
1 Panic Threshold	2005AT MSES25SS x Opening Width		PE

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Set: 2.1Doors: [130](#)

Description: Single - Exterior - Exit Device-MELR - Closer w/Stop Arm

1 Continuous Hinge	CFMHD1 SER*		PE	
1 Rim Exit Device, Storeroom	HC LC 55 56 8804 862	US32D	SA	
1 Cylinder	Match existing Yale			
1 Surface Closer	TB 351 CPS brkt/spacer as req	EN	SA	
1 Kick Plate	K1050 10" BEV CSK	US32D	RO	
1 Gasketing	2891AS (head & jambs)		PE	
1 Rain Guard	346C x Frame Width		PE	
1 Sweep	345ANB x Dr. Width		PE	
1 Panic Threshold	2005AT MSES25SS x Opening Width		PE	
1 ElectroLynx Harness	QC-C1500P		MK	
1 ElectroLynx Harness	QC-CxxxP		MK	
1 Position Switch	DPS-BK		SU	
1 Power Supply	AQDx size as req		SU	
1 Cqrd Reader	By Security		OT	

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

Set: 3.0Doors: [FP-1](#)

Description: Single - Exterior - Lock

1 Continuous Hinge	CFM HD1		PE
1 Storeroom Deadbolt Lock	LC 8251 TOMD	US32D	SA
1 Cylinder	Match existing Yale		
1 Surface Closer	TB 351 CPS brkt/spacer as req	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Gasketing	2891AS (head & jambs)		PE
1 Rain Guard	346C x Frame Width		PE
1 Sweep	345ANB x Dr. Width		PE
1 Panic Threshold	2005AT MSES25SS x Opening Width		PE

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Set: 3.1Doors: [300](#)

Description: Single - Exterior - Lock - Inswing

1 Continuous Hinge	CFM HD1		PE
1 Storeroom Deadbolt Lock	LC 8251 TOMD	US32D	SA
1 Cylinder	Match existing Yale		
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	2891AS (head & jambs)		PE
1 Rain Guard	346C x Frame Width		PE
1 Sweep	345ANB x Dr. Width		PE
1 Threshold	171A x Opening Width		PE

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer

Set: 4.0Doors: [111](#)

Description: Pr Classroom Exit - Closer

8 Hinge (heavy weight)	T4A3786	US26D	MK
2 Surface Vert Rod Exit, Classroom	LC NB8713 ETMD	US32D	SA
2 Cylinder	Match existing Yale		
2 Closer	351 O / P10 as required	EN	SA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
2 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Astragal Set (2)	18061CNB x Dr. Ht.		PE
1 Gasketing	S88BL (head & jambs)		PE

Set: 5.0Doors: [100B](#)

Description: Single Rated MELR Exit

1 Hinge, Full Mortise, Hvy Wt	T4A3786 QC*	US26D	MK
2 Hinge (heavy weight)	T4A3786	US26D	MK
1 Rim Exit Device, Storeroom	12 LC 55 56 8804 ETMD	US32D	SA 
1 Cylinder	Match existing Yale		
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE
1 ElectroLynx Harness	QC-C1500P		MK 
1 ElectroLynx Harness	QC-CxxxP		MK 
1 Position Switch	DPS-BK		SU 
1 Power Supply	AQDx size as req		SU 
1 Cqrd Reader	By Security		OT

Notes: Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

Set: 6.0Doors: [113](#), [131A](#), [202](#), [202A](#)

Description: Single Rated Stair Passage

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Rim Exit Device, Passage	12 8815 ETMD	US32D	SA
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE

Notes: Closer in stairwell

Set: 7.0Doors: [201A](#)

Description: Pr Rated MELR x RX Exit - Gasket

2 Hinge, Full Mortise, Hvy Wt	T4A3786 QC*	US26D	MK
4 Hinge (heavy weight)	T4A3786	US26D	MK
1 Surface Vert Rod Exit	12 LC 55 56 NB8706 ETMD	US32D	SA 
1 Surface Vert Rod Exit	12 55 NB8710 ETMD	US32D	SA 
1 Cylinder	Match existing Yale		
2 Door Closer	351 PS	EN	SA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Astragal Set (2)	18061CNB x Dr. Ht.		PE
1 Gasketing	S88BL (head & jambs)		PE

2 ElectroLynx Harness	QC-C1500P	MK	⚡
2 ElectroLynx Harness	QC-CxxxP	MK	⚡
2 Position Switch	DPS-BK	SU	⚡
1 Power Supply	AQDx size as req	SU	⚡
1 Cqrd Reader	By Security	OT	

Notes: Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

Set: 8.0

Doors: [124](#), [131](#), [132](#), [203](#)

Description: Single Storeroom - Closer - Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	LC 8204 TOMD	US32D	SA
1 Cylinder	Match existing Yale		
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE

Set: 8.1

Doors: [122](#), [150](#)

Description: Single Access Control Lock - Closer - Gasket

2 Hinge, Full Mortise	TA2714	US26D	MK
1 Hinge, Full Mortise	TA2714 QC*	US26D	MK
1 Fail Secure Lock	LC RX 8271 TOMD	US26D	SA ⚡
1 Cylinder	Match existing Yale		
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE
1 ElectroLynx Harness	QC-C1500P		MK ⚡
1 ElectroLynx Harness	QC-CxxxP		MK ⚡
1 Position Switch	DPS-BK		SU ⚡
1 Power Supply	AQDx size as req		SU ⚡
1 Cqrd Reader	By Security		OT

Notes: Door is normally closed and secure. Presentation of valid credential allows entry by trim. Upon loss of power, door will remain secure. Free egress at all times.

Set: 9.0Doors: [114](#), [115](#), [133](#)

Description: Single Office

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Office/Entry Lock	LC 8205 TOMD	US32D	SA
1 Cylinder	Match existing Yale		
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
3 Silencer	608-RKW		RO
1 Coat Hook	RM802	US32D	RO

Set: 10.0Doors: [112A](#), [116](#), [117](#)

Description: Pr Classroom - AFB - Closer

8 Hinge, Full Mortise	TA2714	US26D	MK
1 Flush Bolt w/Fire Bolt	2848 / 2948	US32D	RO
1 Classroom Lock	LC 8237 TOMD	US26D	SA
1 Cylinder	Match existing Yale		
1 Coordinator	2672	US28	RO
2 Mounting Bracket	2601xx	US28	RO
2 Closer	351 O / P10 as required	EN	SA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
2 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Astragal Set (2)	18061CNB x Dr. Ht.		PE
1 Gasketing	S88BL (head & jambs)		PE

Set: 11.0Doors: [151A](#)

Description: Pr Classroom - AFB - Closer/stop

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Flush Bolt w/Fire Bolt	2848 / 2948	US32D	RO
1 Classroom Lock	LC 8237 TOMD	US26D	SA
1 Cylinder	Match existing Yale		
1 Coordinator	2672	US28	RO
2 Mounting Bracket	2601xx	US28	RO
2 Door Closer	351 PS	EN	SA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Astragal Set (2)	18061CNB x Dr. Ht.		PE
1 Gasketing	S88BL (head & jambs)		PE

Set: 12.0

Description: Not Used

1 Set	Not Used		OT

Set: 13.0

Doors: 102, 103, 121, 123

Description: Single Restroom

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	V20 EMB 8265 TOMD	US26D	SA
1 Closer	351 O / P10 as required	EN	SA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Mop Plate	K1050 6" BEV CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE
1 Coat Hook	RM802	US32D	RO

Set: 14.0

Doors: 110, 110A, 112, 130A, 130B, 130C, 151

Description: OH Door

1 Cylinder	Match existing Yale		
1 Balance of hardware	By the door manufacturer		OT

Notes: Confirm cylinder type required.

Set: 15.0

Doors: 130D, 201

Description: Fire Rated Alum

1 Cylinder	Match existing Yale		
1 Balance of hardware	By the door manufacturer		OT

Notes: Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

END OF SECTION 08710

GLAZING**SECTION 08800****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. The required applications of glass and glazing include but are not necessarily limited to the following:
 - 1. Glazing exterior and interior curtainwall, entrances and punched windows (Section 08900).
 - 2. Glazed interior storefront and entrances (Section 08410).
 - 3. Glazing interior wood and metal doors.
 - 4. Glazing interior partitions and miscellaneous interior glazing.
 - 5. Mirror glazing, excluding packaged mirror units in Section 10800.
- B. Generally glass types required are as follows unless otherwise indicated on the Drawings:
 - 1. Exterior: Provide insulated units, Low-E coating on no.2 surface of 1/4" HS clear exterior lite, 1/2" air space and interior lite of 9/16" thick laminated unit of 1/4" HS clear glass .090 Dupont SGP interlayer and 1/4" HS clear glass. Heat strengthen each lite as required to meet wind loads specified in Section 08900 and also meeting large missile requirements. Provide 9/16" thick laminated unit to match insulated units at exterior doors. Provide tempered exterior lite of insulated units where safety glass is required.
 - 2. See Section 05522-Railing Systems for interior glass railing
 - 3. Glass and framing meeting missile impact criteria per requirements of SBCCI SST-12, and ASTM E1886 and E1996, meeting requirements of the Large Missile Test of ASTM E 1996
- C. See Section 08900- Curtainwall for performance requirements

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Sealant and back-up material.
- B. Section 08112 - Steel Doors.
- C. Section 08900 - Aluminum Curtainwall and Entrances.

1.03 REFERENCES

- A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

- C. ASTM C1036 - Flat Glass.
- D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
- E. ASTM E546 - Test Method For Frost Point of Sealed Insulating Glass Units.
- F. ASTM E576 - Test Method For Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.
- G. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.
- H. ASTM E774 - Sealed Insulating Glass Units.
- I. FGMA - Glazing Manual.
- J. FGMA - Sealant Manual.
- K. FS DD-G-45ID - Glass, Plate, Sheet, Figure (Flat, for Glazing, Mirrors and other Uses).
- L. FS TT-C-00598 - Caulking Compound, Oil and Resin Base Type.
- M. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.
- N. FS TT-S-00227 - Sealing Compound, Rubber Base, Two Component.
- O. FS TT-S-00230 - Sealing Compounds, Synthetic-Rubber Base, Single Component, Chemically Curing.
- P. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.
- Q. FS TT-G-410 - Glazing Compound, Sash (Metal) for Back Bedding and Face Glazing (Not for Channel or Stop Glazing).
- R. Laminators Safety Glass Association - Standards Manual.
- S. SIGMA - Sealed Insulated Glass Manufacturers Association.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.
- B. Glass and glazing materials of this Section shall provide continuity of building enclosure.
 - 1. To utilize the inner pane of multiple pane sealed units for the continuity of the air and vapor seal.
 - 2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane

to heel bead of glazing sealant.

- C. Provide thickness and/or heat treatment of glass as required to meet the wind loads (pounds/square foot) specified in Section 08900 and large missile impact requirements, required in sections specifying the systems in which glass is included, but not less than 1/4" thick; based on wind loading duration of 60 seconds, maximum allowable breakage probability at initial occurrence of design load of 8 lites/1000 (design safety factor of 2.5), and 1 lite/thousand and at overhead glazing.
- D. Limit glass deflection to 1/200 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two (2) samples, 12 x 12 inch in size, illustrating glass units; also glass units incorporated in curtainwall sample.
- E. Samples: Submit 12 inch long bead of glazing gaskets, color as selected.
- F. Manufacturer's Installation Instructions: Indicate special precautions required.
- G. Manufacturer's Certificate: Certify that sealed insulated glass, meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, SIGMA and Laminators Safety Glass Association - Standards Manual for glazing installation methods.
- B. Safety Glazing Standards: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials, dated January 6, 1977 (The Consumer Product Safety Commission), i.e. doors, sidelights, etc.
- C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label or inspecting and testing organization indicated below:
 - 1. Insulating Glass Certification Council (IGCC).
- D. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.07 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section; see Section 01200.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop Drawings and as instructed by the manufacturer.

1.10 COORDINATION

- A. Coordinate the work with glazing frames.

1.11 WARRANTY

- A. **Manufacturer's Warranty on Insulating Glass Products:** Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacturer, freight allowed to project site, within specified warranty period indicated below, replacements for those insulating glass units which develop manufacturing defects. Manufacturing defects are defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging at temperature above 20°F (-29°C), and other visual indications of seal failure or performance.
 - 1. **Warranty Period:** Manufacturer's standard but not less than 10 years after date of substantial completion.
- B. **Manufacturer's Warranty on Laminated Glass:** Provide written warranty signed by manufacturer of laminated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, laminated glass units which develop manufacturing defects. Manufacturing defects are defined as edge separation or delamination which materially obstructs vision through glass.
 - 1. **Warranty Period:** Manufacturer's standard but not less than 5 years after date of substantial completion.
- C. **Manufacturer's Warranty on Coated (Reflective) Glass:** Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, coated glass units which develop manufacturing defects. Manufacturing defects are defined herein, due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.
 - 1. **Warranty Period:** Manufacturer's standard but not less than 10 years after date of substantial completion.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL:

- A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.
- B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.
- C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application and performance indicated.

2.02 PRIMARY GLASS PRODUCTS

- A. Clear Float Glass: Type I, Class 1 (transparent), quality q3 (glazing select).
- B. Mirror Glass: Clear float type with copper and silver coating, organic overcoating, square and lapped edges, 1/4 inch thick minimum.

2.03 HEAT-TREATED PRODUCTS

- A. Manufacturing Process: Manufacture heat-treated glass as follows:
 - 1. Horizontal (roller hearth) process with minimal roll wave distortion parallel with bottom edge of glass as installed to eliminate tong marks.
 - 2. Tempered glass shall be strengthened in bending to not less than 4.5 times annealed glass strength.
 - 3. Heat-strengthened glass shall be strengthened in bending to not less than 2.0 times annealed glass strength.
 - 4. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a 2 hour dwell at 290°C±10°C.
 - 5. Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.
- B. Tolerances: Heat strengthened and tempered glass shall be examined by the glass manufacturer to detect and discard any lights which exceed the following tolerances
Maximum peak to valley rollerwave 0.003" (0.08mm) in the central area and 0.008" (0.20mm) within 10.5" (267mm) of the leading and trailing edge. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or – 100 mD (millidiopter) over 95% of the glass surface. Maximum bow and warp 1/32" per lineal foot (0.79mm). Where bow tolerance and wave tolerance differ, the stricter requirement shall govern.
- C. Clear Tempered Float Glass: Grade B (fully tempered), style I (uncoated surfaces), type 1

(float), quality q3 (glazing quality), class 1 (transparent).

- D. Clear Heat-Strengthened Float Glass: Grade A (heat strengthened), style I (uncoated surfaces), type 1 (float), quality q3 (glazing select), class 1 (transparent).

2.04 COATED GLASS PRODUCTS

- A. General: Performance characteristics designated for coated glass products below are based on manufacturer's published test data for 1/4" thick glass products, unless otherwise indicated. Refer to primary and heat-treated glass requirements relating to properties of glass products to which coatings are applied.

1. Provide heat-strengthened coated float glass except provide tempered units where coated safety glass is indicated or required for performance and loads.

- B. Coating shall be subject to the following criteria:

1. Pinholes with diameter greater than 1/16 inch are not permitted.
2. Individual pinholes with diameter 1/16 inch or less are permitted only within three (3) inches of an edge.
3. Cluster of pinholes (regardless of diameter or location) visible at 6 feet are not permitted.
4. Scratches, rub marks or other gaps in the coating are not permitted where any portion thereof could include a circle of diameter exceeding 1/16 inch. Where the included circle is 1/16 inch or less, scratches, rub marks or other gaps visible at 10 feet are permitted only within three (3) inches of an edge.
5. Streaks or splotches resulting from nonuniformity of the coating which are visible from the building interior or exterior are not permitted.
6. Color range must fall within the limits established by approved samples.

2.05 LAMINATED GLASS

- A. Plastic Interlayer: Provide glass fabricator's standard clear polyvinyl butyral interlayer for laminating sheet of glass, with a proven record of showing no tendency to bubble, discolor or lose physical or mechanical properties after laminating and installation, in colors and of thickness indicated.

1. Product: Subject to compliance with requirements, provide DuPont™ "Sentry Glass Plus" innerlayer

- B. Laminating Process: Fabricate laminated glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substance and air/glass pockets.

- C. Laminated Safety Glass : Two sheets of HS glass laminated together with a .090 Dupont SGP interlayer and complying with requirements indicated below: Heat strengthen each lite

1. Exterior Sheet: 1/4" HS coated glass (match insulated units).
2. Interior Sheet: 1/4" clear HS glass.
3. Overall Thickness: 9/16".

- D. 9/16" thick clear laminated glass, with glass and framing meeting large missile impact criteria per requirements of SSTD-12, hurricane/impact resistance complying with 2021 IBC Code. Two sheets of glass laminated together with a minimum .060 Dupont SGP interlayer or thicker if required to meet SSTD-12 and ASTM E1886 and E1996.

2.06 SEALED INSULATING GLASS UNITS

- A. Insulating Glass: Provide sheets of heat strengthened glass complying with ASTM E 774 as follows, and 1/2" gas-filled space with -20°F dew point, with Class A silicone sealant-type edge construction to maintain a hermetic seal as certified by the Insulating Glass Certification Council (I.G.C.C.) with silicone secondary seal at structural silicone joints; fabricated to provide the following overall performance characteristics:
1. Exterior Sheet: Low -E (Sputtered) Coated HS clear glass 1/4" thick, with coating placed on No. 2 surface.
 2. Interior Sheet: 9/16" thick clear HS laminated clear glass with .090 Dupont SGP interlayer.
 3. **Note: Heat strengthen each lite**
 4. Performance: As follows:
 - a. Light transmission (visible): 39%
 - b. Light reflectance (outdoor visible): 8%
 - c. U-value (winter nighttime): 0.24
 - d. Solar Heat Gain Coefficient: 0.20
 - e. LSG: 1.95
 - f. Approved: Equal to "Solarban 70 (2) Solarbronze + Clear Glass Insulating Glass Unit" by Vitro
 4. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer-bar frame with welded or soldered sealed corners, and filled with dessicant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).

2.07 GLAZING ACCESSORIES

- A. General: All glazing accessories shall be compatible with all sealants within the system and with sealant at edge of insulated glass units.
- B. Setting Blocks: Neoprene, EPDM or Silicone as recommended by the glazing manufacturer, 80 - 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- C. Spacers: Neoprene, EPDM or Silicone 50 - 60 Shore A durometer hardness, minimum 3 inch long x one-half the height of the glazing stop x thickness to suit application.
- D. Edge Blocks: Neoprene, EPDM or Silicone extruded shape of size and hardness required to limit lateral movement (side-walking) of glass.
- E. Butyl Rubber Glazing Tape: Partly-vulcanized, self-adhesive, non-staining, elastomeric butyl

rubber tape, 98% solids, intended for 35% compression, no appreciable deterioration for 3000 hour test in Atlas Weathermeter.

- F. Mirror Attachment Accessories: Stainless steel clips for the bottom edge and mirror adhesive, chemically compatible with mirror coating and wall substrate equal to products by Palmer Products Corporation.

2.08 GLAZING GASKETS

- A. See Section 08900 for requirements for gaskets.
- B. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene or EPDM gaskets of profile and hardness required to maintain watertight seal; complying with ASTM C 864, Option 1.
- C. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

2.09 GLAZING SEALANT/COMPOUNDS

- A. Provide exposed glazing materials of color selected by the Architect from manufacturer's standard colors. Provide hardness of materials as recommended by the manufacturer for the required application and condition of installation in each case. Provide only compounds which are proved to be fully compatible with surfaces contacted.
- B. Silicone Rubber Glazing Sealant: Silicone rubber, one-part elastomeric sealant, complying with FS TT-S-001543, Class A, high modulus silicone glazing compound, acid curing. One of the following:
 - 1. Dowsil 999A Silicone Glazing Sealant
 - 2. SCS 1200; General Electric Co.
 - 3. Proglaze; Tremco

2.10 STRUCTURAL SILICONE SEALANT

- A. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural and weatherseal sealant as follows:
 - 1. "Ultraglaze SSG 4000" by G.E. for field applications
 - 2. "795" by Dowsil for field application and "983" for application in the factory or unitized construction.
- B. Color: As selected by Architect from manufacturer's full range of colors.
- C. Tensile Strength: 100 psi (689.5 kPa) minimum.
- D. Provide sealant with high modulus of elasticity that will not allow movement of more than 25 percent of joint width, unless less movement is required by structural-sealant-glazed systems'

design.

PART 3 - EXECUTION

3.012 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.02 PREPARATION

- A. Pre-Installation Meeting: At Contractor's direction, Glazier, sealant and gasket manufacturers' technical representatives, glass framing erector and other trades whose work affects glass and glazing shall meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.
- B. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 GLAZING

- A. Watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind 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. Comply with "Glazing Manual" by Flat Glass Marketing Association except as shown and specified otherwise, and except as specifically recommend otherwise by the manufacturers of the glass and glazing materials.
 - 1. Provide a minimum nominal glass bite of 1/2".
- C. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- D. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- E. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

- F. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- G. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from each corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- H. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except sealant tape use thickness slightly less than final compressed thickness of tape.
- I. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- J. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- K. Structural Silicone Butt Glazing: Temporarily clamp glass during cure of structural silicone. After sufficient cure, remove clamps and fill any gaps in sealant. Mask glass and aluminum during application of silicone sealant. Remove masking immediately after tooling sealant.
- L. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- M. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.
 - 1. Miter cut and permanently bond gasket ends together by vulcanized process or silicone adhesive at corners so that gaskets will not pull away from the corners and result in voids or leaks in the glazing system.
 - 2. Install structural silicone sealant as required to meet large missile requirement

3.04 MISCELLANEOUS INTERIOR GLAZING

- A. Install glazing tape in accordance with manufacturer's instructions.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting spline and sealing junctions with manufacturer's recommended sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

- E. Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.

3.05 INSTALLATION - MIRRORS

- A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions except lower edge of mirror shall be set with clips. Anchor rigidly to wall construction.
 - 1. Unless otherwise recommended by mirror manufacturer, limit mastic coverage to 25% of mirror back where mirror is permanently supported on bottom edge, otherwise limit coverage to 60 - 80%. Press mirror into positions, checking for plumb and true position.

3.06 MANUFACTURER'S FIELD SERVICES

- A. Glass product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures, and unacceptable conditions.

3.07 CLEANING

- A. Clean work under provisions of 01700.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after work is complete.
- D. Clean glass and mirrors.

3.08 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

ALUMINUM CURTAINWALL AND ENTRANCES**SECTION 08900****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. All curtainwall work with the major components to include, but not necessarily limited to the following for single-source responsibility, with the extent indicated on the Drawings. Curtainwall glazing system shall be engineered to meet the specified performance, complying with profiles indicated on the drawings and performance specified herein
1. Exterior aluminum wall framing systems, (not including the building structure) to receive glass and other components, and all concealed secondary structural framing required to meet specified loads independent of building structure.
 - a. System shall be installed at curtainwall conditions and also exterior punched and clerestory glazed openings
 - b. Attachment to horizontal structural framing with concealed system to reduce curtainwall spans where indicated on the drawings
 2. Flashing at parapet as an extension of the curtainwall system.
 3. Glass and glazing for each component.
 4. Sealants, caulking, joint fillers, and gaskets in conjunction with each component.
 5. Anchors, inserts, support brackets, expansion devices, fasteners, flashings, vents, weeps, insulation, and similar elements in conjunction with each of the components hereof; support items also include those require embedding in other work, i.e. structure, requires coordination with other work.
 6. Sills and similar border and filler items that are integral with curtainwall system and extensions of the curtainwall system at the roof edges
 7. Coatings in conjunction with curtainwall work, also including separation of all dissimilar materials.
 - a. **Note: see drawings for locations for PVF2 paint coating and dark anodized finish**
 8. Coordination of firestopping installation which is a part of Section 07270 - Firestopping.
 9. Glass framing and glass meeting missile impact criteria per requirements of SBCCI SSTD-12, and ASTM E1886 and E1996, meeting requirements of the Missile Test of ASTM E 1996, with required silicone sealant glass installation.

Large – Missile Impact:
 101. Glazed “medium stile” exterior aluminum entrances including all hardware specified in Section 08710, required to meet the loads specified

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Metal fabricated attachment devices and framed openings.
- B. Section 07900 - Joint Sealers: System perimeter sealant and back-up materials.
- C. Section 08800 - Glazing.

1.03 REFERENCES

- A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. AAMA - Curtain Wall Manual #10 - Care and Handling of Architectural Aluminum From Shop to Site.
- C. AAMA 501 - Methods of Test for Metal Curtain Walls.
- D. AAMA 2605.2 - Specifications for High Performance Organic Coating on Architectural Extrusions and Panels.
- E. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.
- F. ANSI/ASTM A36 - Structural Steel.
- G. ANSI/ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- H. ANSI/ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
- J. ANSI/ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
- K.. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- L. ANSI/ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.

- c. Loosening or weakening of fasteners, attachments, and other components.
 - d. Failure of operating units.
- B. Structural: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as required by and calculated in accordance with the International Building Code 2021 and Supplements (Orleans Parish) and ASCE 7-16, measured in accordance with ANSI/ASTM E330 and when tested in accordance with ANSI/ASTM E330 as follows based on wind loads indicated on the S-series drawing and corners as defined in Code:
- 1. Limit frame deflection to flexure limit of glass or $L/175$ of its unsupported span length, which ever is less, and in no case greater than $3/4$ " for spans up to 14 feet and $L/240$ for spans over 14 feet.
 - 2. No glass breakage, permanent damage to glazing, fasteners or anchors, and no permanent deformation to wall framing members shall occur at a structural test load equal to 1.5 times the specified positive and negative design wind pressure.
 - 3. Deflection of members parallel to the plane of the wall, when carrying its full dead load, shall not exceed an amount that will reduce glass bite by less than 75 percent of the design dimension and shall not reduce edge clearance between itself and the panel, glass, or other fixed member immediately above or below to less than $1/8$ inch.
- C. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with AAMA 501 or ANSI/ASTM E283.
- D. Water Infiltration: No uncontrolled leakage when measured in accordance with AAMA 501 and ASTM E331 with a test pressure difference of 20% of design loads, but in no case less than 15 psf, with water rate of 5 gallons per hr. per sq. ft., nor any water leakage at a dynamic pressure at an air stream equivalent to the static pressure specified.
- E. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 65.
- F. Sound Transmission Loss: When tested to ASTM E90, the Sound Transmission Class (STC) shall not be less than 31 and the outdoor-indoor transmission class (OITC) shall not be less than 25 based upon 1" (25.4) laminated glass ($1/4$ " laminated, $1/2$ " AS, $1/4$ " laminated).
- G. System shall accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads and deflection of structural support framing.
- H. System to provide for expansion and contraction within system components caused by a cycling temperature range of 180 degrees F over a 12 hour period without causing detrimental affect to system components.
- I. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network within the framing system.
- G. Design Requirements:
- 1. Metal stick framed systems.

2. System manufacturer shall provide curtain wall systems, including necessary modifications to meet specified requirements and maintaining visual design concepts.
3. Fabricate glazing systems for exterior glazing at vision areas and exterior glazing at spandrel areas.
4. Perimeter conditions shall allow for installation tolerances, expansion and contraction of adjacent materials, and sealant manufacturer's recommended joint design.
5. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
6. Requirements shown by details are intended to establish basic dimension of unit, sight lines and profiles of members.
7. Do not assume glass, sealants and interior finishes contribute to framing member strength, stiffness or lateral stability.
8. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
9. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
10. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate elevations and details with system dimensions, framed requirements and tolerances, affected related work and expansion and contraction joint location and details. Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
- C. Product Data: Provide data for each component of the assembly, including coatings and glass.
- D. Samples: Submit two (2) samples 2 x 8 inches in size illustrating pre-finished aluminum surfaces and gaskets.
 1. Full size sample of typical framing complete with glass and gaskets illustrating a corner and intersection condition.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements prepared and sealed by a registered Structural Engineer licensed in the State of the project, verifying the ability of members, assemblies, and connections to support the loads specified.
- F. Test Reports: Provide test reports from a qualified independent testing laboratory that show compliance of the manufacturer's glazed aluminum curtain wall system with performance requirements indicated based on comprehensive testing of the system by the laboratory within the last three (3) years current production of the system by the Manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

- B. Conform to requirements of ANSI A117.1.
- C. Responsibility: The Drawings, showing the details of all items indicated herein, are for the sole purpose of defining the design intent and are intended to emphasize the profiles for this project. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for the curtain wall system, including all items listed under "Section Includes" herein, is totally his for single source responsibility, including the design, structural calculations, shop drawings, material installation, warranties, and related documentation and certification required herein.
- D. Basis of Design: Kawneer – 1600 System 1 Curtain Wall (thermally broken, and hurricane and impact rated) – 2 ½” x 7-1/4 deep – 1 5/16” insulated glazing or equal by Southern Walls & Windows, YKK and Old Castle

1.07 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum five (5) years documented experience.

1.08 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section; see Section 01200 - Project Meetings.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Handle work of this section in accordance with AAMA - Curtain Wall Manual #10.
- C. Protect pre-finished aluminum surfaces with wrapping or stripable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.12 WARRANTY

- A. General: All work included in this section shall be fully guaranteed for performance, materials, and workmanship for a period of no less than ten (10) years from the date of Substantial Completion. Guarantees and warranties shall be delivered to the Owner in duplicate, in an acceptable form, executed by an authorized officer or manufacturer of each material and shall be dated and notarized by a duly authorized Notary Public. Any failure in any of the curtainwall components shall result in an extension of the guarantee period until the

deficiency is permanently repaired.

1. The warranty shall agree to repair or replace defective materials and workmanship of the wall work during the warranty period. Defective materials and workmanship include abnormal deterioration, aging or weathering of the work, leakage of water or air exceeding specified limits, structural failure of components resulting from exposure to pressures and forces up to and including specified limits, failure of operating parts to function normally, deterioration or discoloration of finishes in excess of normal weathering and aging, glass breakage, secondary glass damage or breakage, failure of sealants and failure of the work to fulfill specified performance requirements.
- B. Coating shall be warranted for twenty (20) years against performance less than that specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper for extruded structural framing members.
- B. Sheet Aluminum: ANSI/ASTM B209; alloy and temper suitable for use.
- C. Fasteners: Non-magnetic stainless steel or aluminum or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
 1. Do not use exposed fasteners.
 2. Where fasteners anchor into aluminum less than 0.125" thick, provide non-corrosive pressed-in splined nuts or other type reinforcement to receive fastener threads.
- D. Internal Reinforcing:
 1. ASTM A 36 for carbon steel; or ASTM B 308 for structural aluminum.
 2. Shapes and sizes to suit installation.
 3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS T-F-P-645.
- E. Inserts and Anchorage Devices:
 1. Manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars or tubes.
 2. Shop coat steel assemblies after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
- F. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
- G. Secondary steel supports shall be structural shapes with G90 hot-dip galvanized

2.02 COMPONENTS

- A. Frames: Provide framing systems fabricated from extruded aluminum members of size and profile indicated.
 - 1. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing and silicone to meet large missile requirements. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior
- B. Framing System Gaskets and Joint Fillers: Provide the wall manufacturer's standard permanent type framing system gaskets and joint fillers depending on joint movement and sealing requirements, such as sliding joints, compression joint translation, or non-moving joints.
- C. Brackets and Reinforcements: Where feasible, provide the manufacturer's standard high-strength aluminum units; otherwise provide non-magnetic stainless steel. At the fabricator's option, brackets not exposed to weather or abrasion may be hot-dip galvanized steel complying with requirements of ASTM A 386. Provide non-staining, non-ferrous shims for installation and alignment of curtainwall work.
- D. Concrete or Masonry Inserts: Provide cast iron, malleable iron or hot-dip galvanized steel inserts complying with requirements of ASTM A 386.
- E. Pressure Plate: Pressure plate shall be aluminum and fastened to the mullion with stainless steel screws.
- F Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides a minimum 1/4" (6.3) separation
- G. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads.
- H. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with welded joints.
 - 1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum square glazing stops, with exterior stops anchored for nonremovable.
 - 2. Design: Provide 1-3/4 inch thick doors of design indicated.
 - a. Medium stile (3-1/2 inch nominal width for top and vertical stiles and 10 inch bottom rail as indicated.
- I Weatherstripping: Where exterior door stiles or head rails do not close against fixed stops equipped with compression weatherstripping, provide sliding weatherstripping, retained in an adjustable strip in a mortise centered in the edge of the door.
- J. Flashings: 0.0625 inch thick aluminum, finish to match mullion sections where exposed.

2.03 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 08800 of types described below:
 - 1. Glass: glass specified in Section 08800.
- B. Glazing Gaskets: Provide manufacturer's standard vulcanized corner pressure-glazing or wedge-lock dry glazing system of black resilient elastomeric glazing gaskets, setting blocks and shims or spacers as required; hardness as selected by the wall manufacturer.
 - 1. Sponge gaskets extruded black neoprene w/40±5 durometer Shore A (ASTM D-509-70). Design to provide 20% to 35% compression with vulcanized corners.
 - 2. Dense gaskets extruded black neoprene w/70±5 durometer Shore A for hollow profiles and 60±5 for solid profiles (NAAMM SG-1=70) with vulcanized corners.
 - 3. Structural silicon sealant as required to meet large missile requirements as specified herein.

2.04 SEALANT MATERIALS

- A. Sealant and Backing Materials: Comply with Section 07900 - Joint Sealers of Types described below.
 - 1. Exterior Perimeter Sealant: Type A.
 - 2. Interior Perimeter Sealant: Type B.
 - 3. Sealant Used Within System (Not Used for Glazing): As recommended by curtainwall manufacturer equal to types recommended by sealant manufacturer to remain permanently elastic, tacky, non-drying, non-migrating and weathertight.

2.05 STRUCTURAL SILICONE SEALANT

- B. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural and weatherseal sealant as follows:
 - 1. "Ultraglaze SSG 4000" by G.E. for field applications
 - 2. "795" by Dowsil for field application and "983" for application in the factory or unitized construction.
- C. Color: As selected by Architect from manufacturer's full range of colors.
- D. Tensile Strength: 100 psi (689.5 kPa) minimum.
- E. Provide sealant with high modulus of elasticity that will not allow movement of more than 25 percent of joint width, unless less movement is required by structural-sealant-glazed systems' design

2.06 FABRICATION

- A. Provide thickness of framing members as necessary to comply with the structural loading requirements, but not less than the following:

1. Principal Extrusions: 0.125" min. thickness.
 2. Principal Formed Sheet Members: .1875: min. thickness.
- B. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from exterior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 7. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 8. Double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior
- C. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- D. Prepare components to receive anchor devices.
- E. Arrange fasteners and attachments to conceal from view.
- F. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.
- G. Reinforce framing members for imposed loads.
- H. Where movement should be expected, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or a similar material recommended by the manufacturer.
- I. Provide an individual-member erection system. Except for spandrel panels installed during erection, glazing shall be from inside.
- J. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 8" on center.
- K. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building

2.08 HARDWARE

- A. Hardware: Provide heavy-duty hardware units specified in Section 08710.

2.07 PVF2 PAINT FINISH

- A. General: All surfaces exposed to the exterior shall receive specified high performance fluoropolymer coating and specified acrylic enamel on interior surfaces.
- B. Fluoropolymer Coating; Exterior Surfaces: High performance PVDF base color coating meeting AAMA 2605-11 and containing thermocuring polyvinylidene fluoride (70% solids by weight) supplied under license by manufacturers listed below with minimum rated service life of 20 years as published by the Manufacturer. Pre-treatment, epoxy primer, and finish coat(s) shall be factory baked-on of 1.0-1.5 dry mil thickness (minimum 0.2 dry mil primer and minimum 0.8 dry mil finish) with 2- coat system required for color.
 - 1. Color: equal to metal siding color-Centria “XL Silver - Sundance Series 9957
- C. Polyvinylidene Fluoride (PVDF) Resin Manufacturers:
 - 1. Hylar 5000™, Ausiomont USA, Inc.
 - 2. Kynar 500®, Elf Atochem North America, Inc.
- D. Coating Manufacturers: One of the following:
 - 1. Akzo Chemical, Trinar
 - 2. Lilly Co.,; Nubelar
 - 3. Morton International; Fluoroceram
 - 4. PPG Industries, Inc.; Duranar
 - 5. Valspar Corp.; Fluropon
- E. Performance Requirements: Provide applied coatings of color selected by the Architect that meet or exceed the criteria of AAMA 2605 for the following tests using the test procedures specified in AAMA 2605:
 - 1. Color Uniformity.
 - 2. Specular Gloss.
 - 3. Dry Film Hardness.
 - 4. Film Adhesion.
 - 5. Impact Resistance.
 - 6. Abrasion Resistance.
 - 7. Chemical Resistance.
 - 8. Corrosion Resistance.
 - 9. Weathering.
 - 10. Acid Resistance.
 - 11. Chalking
- G. Qualifications of Applicator: Licensed by the coating manufacturer. Use one applicator for all fluoropolymer coatings in the Project.
- H. Apply one coat of bituminous paint to concealed aluminum and in contact with cementitious or dissimilar materials.

2.08 ANODIZED FINISH

- A. Class I Color Anodized Finish: AA-M12C22A42/A44 (Mechanical Finish) as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color) complying with AAMA 611.
 - 1. Color: Dark Bronze anodized

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining materials are ready to receive work of this Section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings at abutting construction; turn up flashing a minimum of 1/2" to form a concealed continuous pan with soldered/sealed watertight joints including rear and end dams.
- G. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.
- H. Install perimeter sealant in accordance with Section 07900.

3.03 ERECTION TOLERANCES

- A. Limit variations from plumb, level, or dimensioned angle to the following:
 - 1. 1/8" maximum deviation in any 20' horizontal or vertical run.
 - 2. 1/4" maximum deviation in any 40' run, any direction.
- B. Limit variations from location (theoretical calculated positions in plan or elevation based on established floor lines and column lines), including variations from plumb and level, to the following:
 - 1. 3/8" total maximum deviation from any member at any location.
 - 2. 1/8" maximum change in deviation from any member for any 10' run, any direction.

- C. Limit offset in the end-to-end and edge-to-edge alignments of adjoining and consecutive members, which form planes, continuous runs and profiles, to the following:
 - 1. 1/16" maximum offset in any flush alignment, including any which are to be 1/2" or less out-of-flush, and including any which are separated 2" or less by reveal or protrusion in the plane of the wall.
 - 2. 1/8" maximum offset in alignments which are to be out-of-flush by more than 1/2" or separated by a reveal or protrusion of more than 2" width.
- D. 1/32" maximum offset between glass framing members at corners of glazing pockets.

3.07 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Clean work under provisions of 01700.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Protect finished Work from damage.

3.07 FIELD TESTS

- C. Contactor is responsible for and shall pay for field water tests by static test method at 15 psf (**no reductions allowed**) for 15 minutes in accordance with ASTM E1105-15 and with latest updates as required to test glazing system and surrounding construction, shall be performed by the Contractor on completed portions of the curtainwall. In the event that such testing should result in any leakage, eliminate the causes of such leakage at no additional cost to the Owner. Remedial measures must maintain standards of quality and durability and are subject to review by the Architect. Provide powered scaffold, hose, and sufficient personnel to operate scaffold and hose.
 - 1. Six (6) successful water tests (two at curtainwall, two at punched openings and two at clerestory window shall be conducted at the Architect's direction and at his selected areas. Unsuccessful water tests will not be counted a fulfillment of this requirement.
 - 2. Procedures for evaluating the performance for resistance to water and air shall comply with ASTM E1105-15.
- A. Calibration of Equipment

1. All equipment used to provide testing shall be calibrated in the method and within the time periods recommend by the AAMA/ASTM International Specifications.
2. Documentation indicating proper calibration shall be provided to all interested parties.

B. Test Specimen Size and Location

1. Unless otherwise specified by the Architect the test specimen size and location shall be delegated to the third party testing agency.
2. As soon as practical after installation has began, and after the test specimens have been completely installed, adjusted, cleaned and perimeter sealed (including adequate time for sealant to cure) the specimens shall be tested for water penetration.
3. The area to be tested shall include, perimeter caulking, typical splices, frame intersections and, if applicable, at least two entire vision lites and two entire spandrel lites containing an intermediate vertical member and intermediate horizontal member.

C. Field Testing Procedure

1. Water penetration resistance performance shall be determined per ASTM E 1105 using procedure A “Uniform Static Air Pressure Difference”
2. Water penetration attributable to the product specimen shall be defined as penetration of uncontrolled water beyond a plane parallel to the innermost edges of the product.
3. Water contained within drained flashings, gutters and sills in not considered water leakage.
4. If the test specimen fails any part of the test, the responsible contractor shall remediate and the testing agency shall re-test the same test area until it passes. All remedial work must be documented and subject to review by the architect.
5. All other areas of the test specimen that have the same defect shall be remediated. Further, the architect has the option to have the testing agency re-test two additional test areas for each test area that subsequently fails.
- 6 The expense of all remediation and re-testing shall be borne by the Contractor

END OF SECTION

PORTLAND CEMENT PLASTER SOFFITS**SECTION 09221****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Metal furring and lathing; suspension system designed to resist wind loads specified including hanging wires, vertical galvanized steel struts, etc. to meet requirements of specified wind loads
- B. Portland cement plaster system.
- C. Finish: See schedule at end of section.
- D. Soffits and ceilings where indicated.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. ASTM C150 - Portland Cement.
- B. ASTM C206 - Finishing Hydrated Lime.
- C. ASTM C207 - Hydrated Lime for Masonry Purposes.
- D. ASTM C897 - Aggregate for Job-Mixed Portland Cement Based Plasters.
- E. ASTM C926 - Application of Portland Cement Based Plaster.
- F. ASTM C1063 - Installation of Lathing and Furring for Portland Cement Based Plasters.
- G. ASTM E119 - Methods for Fire Tests of Building Construction and Materials.

1.04 SYSTEM DESCRIPTION

- A. Fabricate horizontal elements, hanging wires, vertical galvanized steel struts, etc. to limit finish surface to 1/360 deflection under superimposed dead load and wind uplift loads complying with loads required by the International Building Code (2021), base wind loads indicated on S-series drawings and ASCE-16 with wind loads indicated in the S-series drawings.

1.05 SUBMITTALS

- A. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.
- B. Samples: Submit one sample, 12 x 12 inch in size illustrating finish color and texture.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C926.
- B. Maintain one copy of document on site.

1.07 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum five years documented experience.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply plaster when substrate or ambient air temperature is less than 50 degrees F nor more than 80 degrees F .
- B. Maintain minimum ambient temperature of 50 degrees F. during installation of plaster and until cured.

PART 2 - PRODUCTS

2.01 PLASTER BASE MATERIALS

- A. Cement: ASTM C150, Type I Portland.
- B. Lime: ASTM C206, Type S; ASTM C207, Type S.
- C. Aggregate: In accordance with ASTM C897.
- D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.
- E. Plaster Mix Reinforcement: Glass fibers, chopped to 1/2 inch nominal length, alkali resistant.

2.02 PLASTER FINISH MATERIALS

- A. Cement: As specified for plaster base coat, white color.
- B. Lime: As specified for plaster base coat.
- C. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

2.03 FURRING AND SUSPENSION SYSTEM

- A. Ceiling Hangers (Exterior): Size units in accordance with ASTM 1063 rated “Heavy Duty” and vertical struts as required to meet specified wind loads
- B. Wire Ties: Soft galvanized steel wire. Either 16 gage or double 18 gage for support of furring and 18 gage for lathing and accessories.

- C. Furring Brackets: One-piece metal assembly, with anchor plate and serrated bracket arm adjustable from 1/4" to 2-1/4", fabricated from 20 gage galvanized steel.
- D. Rolled Steel Channels: Either hot-rolled or cold-rolled steel channels of the sizes indicated, with weights complying with ASTM 1063.
- E. Screw-Type Furring Channels: Hat-shaped and special corner-shaped channels formed from 25 gage steel, with knurled faces to facilitate fastener penetration, complying with ASTM C645.

2.04 LATHING AND ACCESSORIES

- A. Metal Lath: ASTM C847; galvanized, 3.4 lb/sq yd.; self furring at solid substrates (if any).
- B. Casing Bead: Formed zinc; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.
- C. Corner Bead: Formed zinc; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.
- D. Base Screed: Formed zinc; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.
- F. Corner Mesh: Formed zinc, minimum 26 gage thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches wide.
- E. Control Joint Accessories: Formed zinc, minimum 26 gage thick; accordion profile, 2 inch expanded metal flanges each side.
- F. Two-Piece Expansion Joint (Used at double stud joints): Formed zinc, 26 gage thick, two-piece male/female joint unit, adjustable from 1/4" to 5/8".
- G. Anchorage Methods: Screws, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

2.05 CEMENT PLASTER MIXES

- A. General: Comply with ASTM C 926 for portland cement plaster base and finish coat mixes as applicable to plaster bases, materials, and other requirements indicated.
- B. Portland Cement Plaster Base Coat Mixes and Compositions: Proportion materials and respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.
 - 1. Fiber Content: Add fiber to following mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's directions but do not to exceed 2 lbs. per cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

- C. Three-Coat Work Over Metal Lath: Base coats as indicated below:
 - 1. Scratch Coat: 1 part portland cement, 0 to 3/4 parts lime, 2-1/2 to 4 parts sand.
 - 2. Brown Coat: 1 part portland cement, 0 to 3/4 parts lime, 3 to 5 parts sand (approximately 1 bag of cement, 1/2 bag of lime and 4 cu. ft of sand).
- D. Job-Mixed Portland Cement Plaster Finish Coats: Proportion materials for finish coats in parts by volume for cementitious materials and parts by volume per sum of cementitious materials for aggregates to comply with the following requirements:
 - 1. 1 part portland cement, 3/4 to 1-1/2 parts lime, 3 parts sand (approximately 1 bag of cement, 1/2 bag of lime and 3 cu. ft of sand).
- E. Mechanically mix cementitious and aggregate materials for plasters to comply with the applicable referenced application standard and with recommendations of plaster manufacturer. Mix materials in approved mechanical mixers of the type in which the quantity of water can be controlled accurately and uniformly, except that finish coats containing lime may be hand mixed. While the mixer is in continuous operation, add approximately 90 percent of the estimated quantity of water, half of the sand, all of the cementitious materials, and the other one-half of the sand shall be introduced into the mixture in that sequence and mix thoroughly with the remainder of the water until the mixture is uniform in color and consistency. Avoid excessive mixing or agitation. Discard plaster which has begun to set before it is used; retempering will not be permitted. Do not use frozen, caked, or lumped materials. Empty mixers and mixing boxes completely after each batch is mixed, and keep free of old plaster.
- F. Mix only as much plaster as can be used prior to initial set.
- G. Mix materials dry, to uniform color and consistency, before adding water.
- H. Protect mixtures from freezing, frost, contamination, and evaporation.
- I. Do not retemper mixes after initial set has occurred.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify surfaces and site conditions.

3.02 INSTALLATION FURRING AND SUSPENSION SYSTEMS

- A. Comply with ASTM 1063, "Heavy duty" system and added vertical struts.
- B. Isolation: Where metal furring and lathing abuts building structure horizontally or vertically, isolate the work to prevent the transfer of loading and structural movement into the furring and lathing, so that slip or cushion-type joints will absorb the deflections or movements.
- C. Frame both sides of expansion and control joints with structural metal supports, and do not bridge the joint with runners, furring or lathing.

3.03 INSTALLATION - LATHING MATERIALS

- A. Apply lath reinforcement perpendicular to supports in accordance with ASTM 1063.
- B. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.
- C. Attach metal lath through gypsum sheathing into metal supports using screws at maximum 6 inches on center.

3.04 INSTALLATION - ACCESSORIES

- A. Continuously reinforce internal angles with corner mesh, return metal lath 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- B. Place corner bead at external wall corners; fasten at outer edges of lath only.
- C. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.
- D. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.
- E. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- F. Install frames plumb and level in opening. Secure rigidly in place.
- G. Position to provide convenient access to concealed work requiring access.

3.05 CONTROL JOINTS

- A. In addition to locations of joints indicated on the drawings for walls and soffits, or if not indicated, provide control joints and expansion joints at locations complying with the following criteria, approved by the Architect:
 - 1. For exterior plaster, install control joints to create panels no larger than 144 square feet each panel, with no dimension exceeding 18 feet or exceeding a length-to-width ratio of 2 1/2 to 1, and above and below door and window openings. Provide two-piece expansion joints at all floor lines.
- B. Establish control joints with specified joint device.
- C. Coordinate joint placement with other related work.
- D. Install backer rod and sealant at all joints in the field of the plaster and at joints at perimeter abutting other materials.
- E. Seal the intersections of control joints with one or two part urethane sealant to provide watertight connections.
- F. Vertical control joints shall be installed uninterrupted with horizontal joints abutting the verticals.

3.06 PLASTERING

- A. Apply plaster in accordance with ASTM C926.
- B. Apply scratch coat to a nominal thickness of 1/2 inch, brown coat to a nominal thickness of 3/8 inch, and a finish coat to a nominal thickness of 1/8 inch over self-furring reinforcement.
- C. Moist cure scratch and brown coats by keeping moist for at least 48 hours by applying a very fine fog spray at least twice daily. Apply brown coat immediately following initial set of scratch coat.
- D. After curing, dampen base coat prior to applying finish coat.
- E. Apply finish coat and work to a smooth and consistent finish.
- F. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
- G. Moist cure finish coat for minimum period of 48 hours.

3.07 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet .

3.08 SYSTEM/FINISH SCHEDULES

- A. Exterior : Three coat cement plaster for sand float finish over self-furring metal lath.

END OF SECTION

GYPSUM BOARD SYSTEMS**SECTION 09260**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Metal stud wall framing, 20 gauge (33mils). Provide type and gauge of framing to limit deflection to $L/360$ at 5 psf interior load with no change of indicated stud depth or spacing and height indicated on the Drawings.
 - 1. Provide slotted deflection track at the head of partition extending to the underside of the overhead structural deck
 - 2. "EQ" studs are not permitted
- B. Gypsum board and joint treatment, type X mold resistant everywhere and hi -impact type where indicated on the drawings,.
- C. Acoustical treatment where sound blankets and/or STC rating are indicated on the drawings.
- D. Tile backer units installed with gypsum board assemblies at all walls as base for tile application,
- E. Taped and sanded joint treatment;.
- F. Fire wall identification.

1.02 RELATED SECTIONS

- A. Section 06100 - Carpentry: Woodblocking.
- B. Section 09900 - Painting: Surface finish.

1.03 REFERENCES

- A. AISI S220 - North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members.
- B. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- D. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

- F. ASTM C754 –Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
- G. ASTM C840 - Application and Finishing of GypsumBoard.
- H. ASTM C1002–Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- I. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- J. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- K. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- L. ASTM C1280 – Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
- M. ASTM C1396 – Standard Specification for Gypsum Board.
- N. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- O. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- P. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
- Q. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
- R. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
- S. ASTM E413 – Classification for Rating Sound Insulation.
- T. GA-216 - Recommended Specifications for the Application and Finishing of GypsumBoard.
- U. GA – 253 – Application of Gypsum Sheathing.
- V. GA-600 - Fire Resistance Design Manual.
- W. SFIA – Steel Framing Industry Association.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Product Data: Provide data on metal framing, gypsum board, profiled trim, and joint tape and compound.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GA-216 and GA-600.
- B. Maintain one copy of each document on site.
- C. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.
- D. Single-Source Responsibility for Panel and Finishing Products: Obtain each type of gypsum board and finishing panel products from a single manufacturer.
- E. Provide type and gauge of framing to limit deflection to $L/360$ at 5 psf interior load with no change of indicated stud depth, spacing and height indicated on the Drawings.
- F. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated assemblies as follows:
 - 1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. All fire rated partitions shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Such identification shall be above any decorative ceiling and in concealed spaces stating "Fire and Smoke Barrier-Protect All Openings".
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by, and displaying a classification label from an independent testing agency acceptable to the authority having jurisdiction.

- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Design framing systems in accordance with American Iron and Steel Institute Publication "AIAI S220 –“North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members”, except as otherwise shown or specified.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.
- C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.
- D. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.09 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 and with gypsum board manufacturer's recommendations.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40°F (4°C). For adhesive attachment and finishing of gypsum board, maintain not less than 50°F (10°C) for 48 hours prior to application and continuously after until dry. Do not exceed 95°F (35°C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.01 PARTITION AND WALL FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S220/ASTM C 645 for conditions indicated.
 - 1. Steel Sheet Components: Comply with AISI S220/ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: Comply with ASTM AISI S220/ C 645; ASTM A 653/A 653M G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M,

G40 (Z120) or DiamondPlus® coating; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating. Galvannealed products are not acceptable.

- a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authorities having jurisdiction.
- B. Steel Studs and Runners: AISI S220ASTM C645 with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base steel and for depth:
 1. Thickness: 20 gauge (33 mil) double nested studs at door jambs
 2. Depth: As indicated.
 3. Manufacturer: Member of the Steel Framing Industry Association (SFIA) or the Steel Stud Manufacturers Association.
- C. Steel Rigid Furring Channels: AISI S220ASTM C645, hat-shaped, depth and minimum thickness of base steel as follows:
 1. Depth: 7/8 inch unless otherwise indicated.
 2. Thickness: 20 gauge.
- D. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated and ASTM C514, C1002, and GA-216.

2.02 GYPSUM BOARD MATERIALS

- A. Gypsum Board: ASTM C1396; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges; Type X all locations.
 1. Provide manufacturer's units treated for moisture and mold resistance and achieving score of 10 when tested according to ASTM D3273, "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.", as follows:
 - USG Mold Tough Firecode 5/8" (paper faced)
 - Gold Bond XP Fire-Shield 5/8" (paper faced)
 - ToughRock Mold-Guard by GP
 2. High-Impact Gypsum Board: Classification: Level 3 - Heavy Duty in accordance with ASTM C 1629 Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
 - Gold Bond® brand Hi-Impact XP® Gypsum Board by National Gypsum, and
 - USG Sheetrock® Brand Mold Tough® VHI Firecode® X
- B. Tile Backer Units: Comply with ASTM C1178 Type X, fiberglass faced of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: 5/8 inch, unless otherwise indicated.
2. Width: Manufacturer's standard width but not less than 32 inches.
3. Manufacturer: Dense-Shield Fireguard Tile Backer by G-P Gypsum Co., eXP Tile Backer by Gold Bond/National Gypsum.
4. Joint Tape for Backer Units: Material recommended by backer unit manufacturer.
5. Joint Compound for Backer Unit: Material recommended by backer unit manufacturer.

2.04 ACCESSORIES

- A. Accessories for Interior Installation: Corner beads, edge trim and control joints complying with ASTM C1047 and shall be sheet steel coated with zinc by hot-dip or electrolytic processes.
- B. Shapes indicated below by reference to Fig.1 designations in ASTM C1047:
 1. Corner bead on outside corners, unless otherwise indicated.
 - 1) Product: ClarkDietrich Building Systems; 103 Deluxe Cornerbead, or comparable product.
 2. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
 - 1) Product: ClarkDietrich Building Systems; Metal U-Trim M20A, or comparable product.
 3. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - 1) Product: ClarkDietrich Building Systems; Metal L-Trim M20B, or comparable product.
 4. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.
 - 1) Product: ClarkDietrich Building Systems; #093 Control Joint, or comparable product.
- C. Joint Materials: ASTM C475 and GA 216; reinforcing tape, mold resistant joint compound, adhesive and water.
- D. Fasteners: ASTM C1002, Type S12, W and GA-216.
- E. Sound Attenuation Blankets: Comply with ASTM C 665, Type 1 and ASTM E 136; .70 pcf density, semi-rigid mineral glass blanket without membrane, Class 25 flame-spread, thickness indicated but not less than 3" for friction fit.
- F. Acoustical Sealant: Manufacturer's standard complying with ASTM C919, non staining latex sealant

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.2 METAL WALL FRAMING INSTALLATION

- A. Install framing in accordance with ASTM C754 and C840, GA-216, and GA-600.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co. Screw attach blocking between studs for support of surface mounted items.
 - 1. Plumbing fixtures.
 - 2. Wall cabinets.
 - 4. Toilet accessories
 - 5. Hardware.
 - 6. Architectural woodwork.
 - 7. Grab bars.
 - 8. Handrails and railings.
 - 9. Signage.
 - 10. Other items requiring backing for attachment
- C. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
- D. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- E. Install steel studs and furring in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard, to comply with maximum deflection and minimum loading requirements specified.
- F. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.
- G. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs. Use 20 gauge studs at openings.
- H. Extend stud framing of partitions through the ceiling to the structure above where shown or indicated. Maintain clearance under structural building members to avoid deflection transfer to studs.

- I. Blocking: Nail wood blocking to studs. Bolt or screw steel channels to studs. Install blocking for support of casework and countertops.
- J. Sound Insulation: Install sound attenuation blankets, in partitions where indicated. Completely blanket space between studs to full height of partitions. Fit carefully behind electrical outlets and other work which penetrate partitions for tight fit. Attach to back face of gypsum board in accordance with manufacturer's instructions.
 - 1. Install in ceiling space over partitions where indicated a minimum of two (2) feet each side of partition.

3.3 WALL FURRING INSTALLATION

- C. Erect wall furring for direct attachment to solid back-up walls.
- D. Erect furring channels horizontally; space maximum 16 inches on center, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

3.4 GYPSUM BOARD INSTALLATION

- C. Install gypsum board in accordance with ASTM C840, GA-216 and GA-600.
- D. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At stairwells and other high walls, install panels horizontally with end abutting joints over studs and staggered.
- E. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place. Gypsum board (when installed) shall not sit directly on the floor so not to allow any water to contact the bottom of the gypsum board panel.
- F. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.
- G. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

- H. Double Layer Application: Secure both layers with screws. Place second layer perpendicular to first layer with joints off set from joints of first layer.
- I. Use screws when fastening gypsum board to metal furring or framing.
- J. Install edge trim where edge of gypsum panels would otherwise be exposed or semi-exposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.
 - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and backflange can be attached to framing or supporting substrate.
 - 2. Install L-bead where edge trims can only be installed after gypsum panels are installed.
- K. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- L. Install control joints according to ASTM C840 and manufacturers recommendations, and in specific locations approved by the Architect for visual effect.
- M. Ceramic Tile Base: At areas indicated for ceramic tile finish, install the following backing board. Apply horizontally with uncut edge at bottom or work, 1/4 inch above fixture lip. Seal cut edges of each piece with water resistant sealant before installation and seal around pipe penetrations and similar cut-outs in each sheet.
 - 1. Tile backer units complying with manufacturer's instructions and ANSI A108.11.
 - 2. Cement board complying with ANSI A118.9 at showers.

3.06 ACOUSTICAL TREATMENT

- A. Provide acoustical treatment where indicated on the drawings
- B. Provide the following as required and indicated at acoustically treated walls, i.e. sound blankets indicated, etc. Comply with ASTM C 919 and manufacturer's recommendations for locations of beads.
- C. Seal perimeter of sound-rated work as follows:
 - 1. At partitions, provide continuous beads of acoustical sealant at juncture of both faces of runners of plates with floor and ceiling construction, and wherever work abuts dissimilar materials. Seal prior to installation of gypsum boards. Fill voids with 1/4" minimum to 3/8" maximum round bead of sealant.
 - 2. At ceilings, provide continuous beads of acoustical sealant wherever work abuts dissimilar materials or gypsum board partitions where indicated on the Drawings.
- D. At control joints, provide continuous bead of sealant between edges of wall construction. Seal prior to installation of surface-applied control joint accessories and locate at proper depth in joint to allow for inserting of expansion portion of control joint accessory.

- E. Provide double seal of multi-layer partition faces. Install face layer with 1/4" edge clearance at terminations of work, and install continuous bead of acoustical sealant all around.
- F. At openings and cutouts, fill open spaces between edges of wall construction and fixtures, cabinets, ducts, and other flush or penetrating items and fill pack tightly with glass or mineral fiber insulation and seal with continuous bead of acoustical sealant.
- G. Seal sides and backs of electrical boxes to completely close up openings and joints with a bead of acoustical sealant with maximum joint of 1/4" between drywall edge and box.
- H. Sound Flanking Paths: Where sound-rated partitions intersect non-rated partitions and other rated partitions, extend sound-rated construction to completely close sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.
- I. Ceiling Plenums: Where sound-rated partitions extend through non-sound rated ceilings to structural substrates above, extend the same treatment to that portion of the partition above the ceiling as specified for portion below the ceiling.
- J. Partition Insulation: Install sound attenuation blankets, in partitions where indicated. Completely blanket space between studs to full height of partitions and friction fit snug against the wallboard with no gaps between blankets. Butt ends of blanket together. Fit carefully behind electrical outlets and other work which penetrate partitions for tight fit. Attach to back face of gypsum board in accordance with manufacturer's instructions.
- K. Safing Insulation: Pack voids created by wall intersections at beams. Also use to seal the gap between the top of a partition and the slab to increase the sound transmission loss properties of partitions that are not constructed full height from floor to slab.

3.5 JOINT TREATMENTS

- A. Tape, fill and sand joints, edges, and corners to produce specified surface finish, ready to receive finishes where indicated on the drawings, and as follows in accordance with ASTM C840 and GA-214:
 - 1. Level 1: At ceiling plenum areas and concealed areas, embed tape at joints, unless a higher level finish is required for fire-resistant rated assemblies and sound-rated assemblies.
 - 2. Level 2: At panels that are substrates for tile finish and acoustical tiles, embed tape and apply separate first coat of joint compound to tape, fasteners and trim flanges.
 - 3. Level 3: Where indicated or required by indicated assembly, embed tape and apply separate first and fill coats of joint compound to tape, fasteners and trim flanges.
 - 4. Level 4: Where panels are exposed to view including panels to receive wallcovering, embed tape and apply separate first, fill and finish coats of joint compound to tape, fasteners, accessories and trim flanges. Touchup and sand between coats and after last coat as needed to produce a continuous smooth surface free of visual defects and ready to receive indicated finish.
 - 5. Level 5: Where indicated on the drawings and/or specified herein, embed tape and apply separate first fill and finish coats of joint compound to tape, fasteners,

accessories and trim flanges. Additionally, apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use finish coat joint compound or Tuff-Hide by U.S. Gypsum spray applied, for smooth finish with no evidence of substrate joints. Touch up and sand between coats and after last coat as needed to produce a continuous smooth surface free of visual defects and ready to receive indicated finish

6. At partition indicated with sound blankets and/or STC rating, tape and float all joints full height of partitions.
7. At exterior walls, tape and float all joints full height of wall whether receiving finishes or not.

B. Feather coats on to adjoining surfaces so that camber is maximum $1/32$ inch.

3.7 FIRE WALL IDENTIFICATION

- A. Provide a painted sign with minimum 4 inch letters of the following text: "Fire and Smoke Barrier - Protect All Openings."
- B. Provide at in attics above ceilings, and at attic level where ceilings do not exist, on fire walls shown on plans approximately 25 ft. on centers.

3.8 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: $1/8$ inch in 10 feet in any direction.

END OF SECTION

DRYWALL SHAFT SYSTEMS**SECTION 09265****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Metal stud wall framing, shaftwall board and gypsum board partition system designed for erection entirely from the room side of a shaftway and to include the following:
 - 1. Elevator shaft enclosures-1 hour rating
 - 2. Service shaft enclosures (for piping, ductwork, air plenums, electrical, and similar services)-1 hour rating.
- B. Trim accessories and taped and sanded joint treatment complying with Section 09260.

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Systems
- B. Section 09900 - Painting: Surface finish.

1.03 REFERENCES

- A. ASTM C36 - Gypsum Wallboard
- B. ASTM C1396/C1396M - Gypsum Backing Board and Core Board
- C. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- D. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- E. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board
- F. GA-201 - Gypsum Board for Walls and Ceilings
- G. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board
- H. GA-600 - Fire Resistance Design Manual

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data on metal framing, gypsum board, profiled trim and joint tape. Also include manufacturers "Limiting Height" table to show proposed system with framing, deflection limits and height limits.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GA-216 and GA-600. Maintain one copy of each document on site.
- B. System Design Loading: Provide drywall shaft system designed and tested by manufacturer to withstand a lateral loading (air pressure) of 7.5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to the following:
 - 1. Allowable Deflection: $1/240$ of partition height.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated assemblies as follows:
 - 2. Shaftwall Partitions: Listed assembly by UL, as noted on the Drawings.

PART 2 - PRODUCTS

2.01 FRAMING MATERIALS

- A. Studs and Tracks: AISI S220ASTM C645; galvanized sheet steel, 25 gage or heavier as required for height, deflection and performance indicated.
- B. Fasteners: ASTM C514; ASTM C1002; GA-216
- C. Anchorage to Substrate: Screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.02 GYPSUM BOARD MATERIALS

- A. Shaftwall Board: ASTM C1396/C1396M, 1 inch thick, maximum permissible length; square edges, ends square cut, moisture/mold resistant type.
- B. Exposed Gypsum Board: ASTM C1396; fire resistive (Type X), UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.
- C. Gypsum Type: Tile backer board where gypsum board is a substrate for ceramic tile.
 - 1. Where extends beyond the application of wall tile and receives a painted finish, provide standard taper long-edge profile.

2.03 ACCESSORIES

- A. Fasteners: ASTM C1002, Type S12, W and GA-216.

2.04 BASIC SYSTEM DESCRIPTION

- A. Components and Performance: Shaftwall board, plus 5/8" Type X exposed board on room side; 2-hour rating.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.02 DRYWALL SHAFT SYSTEM INSTALLATION

- A. Install studs in accordance with manufacturers instructions and ASTM C754, Ga-201, GA-216, and GA-600.
- B. Metal Stud Spacing: 24 inches on center unless otherwise required for performance indicated.
- C. Door Opening Framing: Install multiple studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- D. Install gypsum board in accordance with manufacturer's printed instructions.
- E. Use screws when fastening gypsum board to metal furring or framing.
- F. Install supplementary framing, blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings, and similar work which cannot be adequately supported directly on gypsum drywall shaft system.
 - 1. Support elevator hoistway door frames independently of drywall shaft framing system, or reinforce system in accordance with system manufacturer's instructions.
- G. Coordinate drywall shaft system work with sprayed-on fireproofing of the structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of the shaft system.
- H. Integrate stair hanger rods with drywall shaft system where indicated (and where possible); by locating cavity of system as required to enclose rods.
- I. Isolate shaft system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Comply with details shown and with manufacturer's instructions.
- J. In elevator shafts, where drywall shaft system cannot be positioned within 2" of shaft-face of structural beams, floor edges and similar projections into the shaft, provide 5/8" gypsum board cants to cover the tops of the projections. Slope cant panels not more than 15 degrees from vertical. Set base-edge of panels in drywall adhesive and secure top edges to shaft walls

at 24" o.c. with screws.

K. Special Application Requirements:

1. Tile Finish: Where room-side of drywall shaft work is indicated to receive thin-set tile wall finish, use water-resistant type of gypsum backing board as the exposed board of the system.
 2. Work to Receive Drywall Finish: Where room-side of drywall shaft work is indicated to receive drywall finish, including spaces indicated for paint or wall coverings, provide exposed boards with tapered edges and recessed fastener heads, ready for drywall finishing. Otherwise, for unfinished work, edge provide of exposed boards is installer's option, except comply with requirements for fire-resistance and STC ratings.
- L. All fire rated partitions shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Such identification shall be above any decorative ceiling and in concealed spaces stating "Fire and Smoke Barrier - Protect All Openings".

3.03 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

EXTERIOR SHEATHING**SECTION 09290****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Exterior wall sheathing with taped joints for membrane vapor barrier applied over entire exterior wall area. Stagger joints at least one stud on multilayer installations. Joints are taped with 20 mil membrane under Section 07130.

1.02 RELATED SECTIONS

- A. Section 09260 – Drywall systems.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013000-.
- B. Product Data: Provide data on sheathing

1.04 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack panels flat to prevent sagging.
- C. Handle board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 and with gypsum board manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 SHEATHING

- A. Sheathing board for exterior walls shall be "DENS-GLASS GOLD" as manufactured by the Georgia-Pacific Corp. or "FIBEROCK" brand sheathing by U.S. Gypsum and "GlasRoc" by BPB. Performance characteristics as follows:
 - 1. Size: 5/8" thick, Type X, by 4'-0" by 9'-0" to 10'-0".
 - 2. Composition: Gypsum sheathing board core in accordance with ASTM C1177 with fiberglass mattes both sides.
 - 3. Fire resistance: One hour fire rating non combustible when tested in accordance with ASTM E136; when tested in accordance with ASTM E119.
- B. Screws, metal framing: No. 6 Type S or S-12, bugle head, self-tapping, rust resistant.
- C. Materials Warranty: Provide sheathing manufacturer's standard warranty covering sheathing materials for five years commencing on Date of Substantial Completion.
- D. Weathering Warranty: Provide sheathing manufacturer's standard warranty covering in place exposure damage to sheathing for six months commencing on date of purchase by Contractor.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.02 SHEATHING INSTALLATION

- A. Install sheathing, where indicated on the drawings, in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C1280
- B. Install sheathing with gold side out. Tape all joints with permanent waterproof tape
- C. Use maximum lengths possible to minimize number and of joints. Locate edge joints parallel to and located on framing. Stagger intermediate end joints of adjacent lengths of sheathing.
- D. Metal Framing: Attach to metal framing with screws spaced 8" o.c. at perimeter and 8" o.c. along intermediate framing in field
 - 1. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
 - 2. Locate fasteners minimum 3/8" from edges and ends of sheathing panels or as otherwise recommended by the manufacturer. Seal fasteners with Dow Corning 795 or equal.
- E. Caution: The exterior sheathing contains continuous filament fiberglass which can release during normal handling. Take precautions as recommended by the sheathing manufacturer.

END OF SECTION

TILE WORK**SECTION 09300****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Tile floor, wall and base finish and showers as indicated on the drawings.
- B. Thin set applications at floors and walls, and thickset at showers with thinset walls on cement backer board.
 - 1. Tile less than one square meter in size shall be installed per ANSI A108.5, the standard for thin setting. New, “reduced thickness porcelain tile panel/slabs” larger than one square meter, meeting ANSI A137.3 product standard, shall be installed per the new installation standard for these new products, ANSI A108.19
- C. Waterproof membrane shower floors and walls . Provide crack isolation membrane at all cracks in the floors in accordance with TCA F125, and ANSI A118.12 and A108.17
- D. Thresholds at door openings.
- E. Apply grout release product, equal to “Aqua Mix Grout Release” by Custom Building Products, on all tile surfaces before grouting to eliminate grout sticking and staining tile faces

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Systems: Backer boards.
- B. Division 22: Floor drains.

1.03 REFERENCES

- A. ANSI/TCNA A108.1 - Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile installed in Portland Cement Mortar.
- B. ANSI/TCNA A108.4 - Installation of Ceramic Tile with Water Resistant Organic Adhesive.
- C. ANSI/TCNA A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
- D. ANSI/TCNA A108.6 - Ceramic Tile Installed with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
- E. ANSI/TCNA A108.10 - Installation of Grout in Tilework.
- F. ANSI/TCNA A118.3 - Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
- G. ANSI/TCNA A118.4 - Latex Portland Cement Mortar.

- H. ANSI/TCNA A118.7 – Polymer Modified Grouts
- I. ANSI/TCNA A137.1 - Specifications for Ceramic Tile.
- J. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass and Stone Tile Installation.

1.04 SUBMITTALS

- A. Submit product data indicating material specifications, characteristics, and instructions for using mortars and grouts.
 - 1. Data shall also contain and be noted that the mortar and grout materials are recommended for the particular tile specified.
- B. Submit samples under provisions of Section 01300.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.
- D. Submit maintenance data under provisions of Section 01700.
- E. Include recommended cleaning and stain removal methods, cleaning materials.

1.05 QUALITY ASSURANCE

- A. Conform to ANSI/TCA A137.1
- B. Conform to TCNA Handbook for Ceramic Tile Installation.
- C. Setting materials and grouts are based on products of Laticrete International, Inc., and establish the performance standards for the work of this section.
 - 1. Products by W. R. Bonsal Co., Hydroment from Bostik, Custom Building Products and Mapei meeting the performance requirements are acceptable.
- D. Comply with requirements of the American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any), where detectable warning surfaces are indicated on the Drawings.
- E. Warranty: Provide to the owner a Full System Warranty from the installation materials manufacturer for a period of not less than 10 Years from the Date of Substantial Completion

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.
- B. Installer: Company specializing in applying the work of this Section with minimum five years

documented experience. Installer shall be approved by the tile supplier, and/or, Installer shall be factory trained by the tile supplier, and/or, Installer shall be ACT Certified for Thin Porcelain Tile

1. **Note:** At large format tile, recognizing the need for special suction cups, cutting tools, etc, engage an experience installer with successful installations of this scope
- C. All setting and grout materials shall be by the same manufacturer for single source responsibility to assure compatibility and be in compliance with manufacturers Full System Warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in a closed, unventilated environment.
- B. Maintain 50 degrees F (10 degrees C) during installation of mortar materials.

1.09 OWNERS EXTRA STOCK

- A. Provide 5% of total area of specified tile and base in original cartons delivered to Owner for attic stock.
- B. Deliver unused tile and base to Owner's attic stock, as directed by the Owner.

PART 2 - PRODUCTS

2.01 TILE MATERIAL

- A. Tile: ANSI/TCNA A137.1, conforming to the following:

Size	See drawings
Surface Finish	See drawings
Color	See drawings
Coefficient of Friction	Dynamic Coefficient of Friction: >.42 (wet) per ASTM A137.1
- B. Accessories and Base : tile with bull-nosed top edge (where tile is not the wall finish) and coved foot and coved internal vertical corners.
- C. Colors: See drawings.

2.02 MORTAR MATERIALS

- A. Mortar Bond Coat Materials: ANSI/TCA A118.4; portland cement/sand or dry set mortar and latex additive equal to 211 Crete Filler Powder gauged with 4237 Latex Thinset Mortar Additive or 254 Platinum by Laticrete International, Inc. and Prolite® Thin Set mortar by Custom Building Products
1. At large format tiles, provide Prolite® Tile and Stone mortar by Custom Building Products or equal by Laticrete International, Inc and Mapei, specifically recommended for setting large format tiles and for the setting bed thickness indicated, exceeding ANSI A118.4TE, A118.15TE and A118.11

2.03 GROUT MATERIALS

- A. Epoxy Grout: Chemical resistant type, consisting of epoxy resin and hardener complying with ANSI A118.3; "Spectralock Pro Premium" by Laticrete, CEG Lite-Commercial Epoxy Grout by Custom Building Products or Mapei "Kerapoxy". of color selected by the Architect.
1. Epoxy Grout shall be stainproof, chemical resistant 100% solids epoxy with high temperature resistance and shall meet the following minimum physical requirements:
- | | |
|----------------------|---------------------|
| Compressive Strength | 4500 psi Min. |
| Shear Bond Strength | 1000 psi Min. |
| Water Absorption | 1/2% Max. |
| Service Temperature | up to 230°F (110°C) |
2. The finished Epoxy grout shall be chemically and stain resistant to ketchup, mustard, tea, coffee, milk, soda, beer, wine, bleach (5% solution), ammonia, juices, vegetable oil, detergents, brine, sugar, cosmetics and blood. It shall also be chemically resistant to dilute acids and alkalis, gasoline, turpentine and mineral spirit.
- B. Sealant for Expansion Joints: Silicone sealant, moisture and bacteria resistant type, as specified in Section 079000 and 100% silicone Caulk by Custom Building Products

2.03 ACCESSORIES

- A. Thresholds: Marble type, color selected by the Architect, polished finish, full width of wall or frame opening, beveled one side, radiused edges from bevel to vertical face, Group "A" hardness greater than 10.

2.05 WATERPROOFING MEMBRANE

- A. Comply with ANSI A118.10-latest edition for waterproofing membranes. Manufacturer's standard factory prepackaged, job-mixed, proprietary formulation consisting of liquid self-curing rubber polymer for cold application with an integral glass fiber reinforcing. Waterproofing material shall be Laticrete "Hydroband" or "9235 Waterproof Membrane" complying with ASTM C627 or equal "Planicrete W: by Mapei, trowel applied to 30 mil dry

thickness and Redgard Waterproofing and Crack Prevention Membrane by Custom Building and ARDEX S 1-K

1. comply with TCNA F125 full coverage

2.06 CRACK ISOLATION MEMBRANE

- A. Comply with ANSI A118.12 High Performance-latest edition for crack isolation membranes. Manufacturer's standard factory prepackaged, job-mixed, proprietary formulation consisting of liquid self-curing rubber polymer for cold application with an integral glass fiber reinforcing or fabric reinforced. Asphaltic peel & stick membrane used over primer. Crack isolation membranes equal to "Crackbuster Pro Crack Isolation Membrane" by Custom Building Products and "ECB" membrane by NAC.

1. Use over concrete where cracks exists and at control joints for relocating soft joints/movement joints, complying with TCNA F125.

2.07 MORTAR MIX AND GROUT MIX

- A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and indicated ANSI standards.
- B. Machine Mixing: Mixer shall be a rotating blade type mortar mixer. Place liquid in mixer, start machine and add dry material. Mix only long enough to wet out the batch. DO NOT OVERMIX. Stop mixer and dump mortar from mixer promptly. Clean out mixer promptly with water.
- C. Hand Mixing: Place liquid in clean container or mixing box, add dry material and mix. Adjust amount of liquid or dry material to obtain proper consistency.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

3.02 PREPARATION

- A. Protect surrounding work from damage or disfiguration.
- B. Vacuum clean existing substrate and damp clean.
- C. Remove protrusions, bumps and ridges by grinding or chipping.

- D. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Field-Applied Temporary Protective Coating: precoat tiles with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces. Apply a coat of Grout Release, ensuring 100% surface coverage using a sponge applicator, heavy-textured paint roller or brush. Allow a minimum of 30 minutes drying time before grouting. Follow grout manufacturer's instructions for grouting process. Grout Release residue should be removed through normal grout cleanup process

3.03 WATERPROOFING/CRACK ISOLATION INSTALLATION

- A. Apply the system uniformly with application of a minimum of 30 dry mil thickness and reinforcing fabric embedment in strict accordance with manufacturer's printed instructions and ANSI A108.13 for waterproofing and ANSI A108.17 for crack isolation.
 - 1. Sheet membrane shall be set with specified latex-portland cement bond coat.
 - 2. All corners, 4" turn up at vertical behind base; turn down into drains and non-moving construction joints.

3.04 INSTALLATION

- A. Install mortar, tile, threshold and grout to comply with TCA Handbook for Ceramic Tile Installation Handbook Numbers as follows:
 - 1. Tile Floors (thinset with epoxy grout): TCNA method F113 on ground, latex-portland cement bond coat; ANSI A108.5 (tile) and ANSI A108.10 (grout), to achieve bond to full bearing surface of units. Over saw-cut control joints, follow TCNA Method F125 Partial with crack isolation membrane.
 - 2. Tile Walls (thinset): TCA method W245 (at backing board) with latex portland cement bond coat; ANSI A108.5 (tile) and ANSI A108.10 (grout).
 - 3. Showers: TCA method B421C with thickset floor installed with liquid applied specified waterproof membrane on sloping thick setmortar bed equal to SpeedSlope Rapid Setting Sloping Mortar by Custom Building Products with thinset tile with ProLite Large Format Tile Mortar, ANSI A118.15 by Custom Building Products bond coat and epoxy type grout (ANSI A118.5), and thinset walls on cement backer board, waterproof membrane equal to "Hydro Ban" line by Laticrete, "KERDI" waterproof membrane by Schluter, Redgard Waterproofing Membrane by Custom Building Products for tile base and thinset tile and epoxy type grout (ANSI A118.5); ANSI A108.5 (tile) and ANSI A108.8 (grout), and ANSI A108.11 (cement board). See B422C for drain installation similar to that indicated on the drawings; coordinate with plumbing work
 - 5. Expansion Joints: TCA method EJ171, Joint Design with two part urethane sealant and closed cell backing rod.
- B. The setting bond coat mortar shall be applied with a notched trowel using a scraping motion to work the material into good contact with the surface to be covered. A trowel having notches approximately 1/4" x 3/8" is recommended for pavers.
- C. Only as much mortar shall be applied as can be covered within 10-20 minutes, or while surface

is still tacky and wet. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement. When installing paver, a small quantity of the mortar shall be troweled or scraped onto the back of each piece. Pavers shall then be set in place and rapped or beaten with a small beating block to insure 100% full bedding and a true surface. Pavers shall be aligned to show uniform joints and then allowed to set until firm.

- D. Excess mortar shall be cleaned from the surface of the pavers with a wet cloth or sponge while the mortar is fresh.
- E. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment. Place thresholds at exposed floor tile edges.
- F. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor and base.
- G. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar, or excess grout.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep expansion joints free of mortar or grout. Apply backer rods and sealant to joints in accordance with Section 07900.
- J. Allow tile to set for a minimum of 48 hours prior to grouting.
- K. Grout tile joints, packed full and free of all voids and pits. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps. Clean excess mortar as work progresses.
- L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.05 CLEANING

- A. Clean work under provisions of 017000.
- B. Clean tile surfaces. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, in accordance with manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.

3.06 PROTECTION

- A. Protect finished installation under provisions of Section 01500.

- B. After cleaning, provide protective covering and maintain conditions to protect tile work from damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood or similar material.
- C. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work

END OF SECTION

EPOXY TERRAZZO FLOORING**SECTION 09400****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

1. Epoxy terrazzo flooring; 1/4 inch-3/8 inch thick depending on the aggregate selected, with patterns and divider strip locations as indicated on the drawings. Install crack reduction membrane where required and moisture resistant treatment rated for 98% RH under the entire terrazzo installation.
2. Also, provide terrazzo flooring on plywood substrate in elevator cabs.

B. Related Sections:

1. Division 7 Section "Joint Sealants" for sealants installed with terrazzo.

1.3 SUBMITTALS**A. Product Data:** For each type of product indicated.**B. Shop Drawings:** Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:

1. Divider strips.
2. Control-joint strips.
3. Accessory strips.
4. Expansion-joint strips.
5. Precast terrazzo jointing and edge configurations.
6. Terrazzo patterns.

C. Samples for Initial Selection: NTMA color plates showing the full range of colors and patterns available for each terrazzo type indicated.**D. Samples for Verification:** For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify matrix color and marble-chip types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:

1. Terrazzo: 6-inch- (150-mm square Samples.
2. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.

E. Qualification Data: Submit proof of Contractor membership in NTMA

- F. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- G. Maintenance Data: For terrazzo to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is a contractor member of NTMA.
- B. Source Limitations for Marble Chips: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.
- C. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 100 sq. ft. (9 sq. m) of typical poured-in-place flooring[condition for each color and pattern in locations directed by Architect
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site
 - 1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.
 - d. Review dust-control procedures.
 - e. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
- F. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Basis of design: Terroxy; Terrazzo & Marble Supply Company
 - 2. Kpoxy Resin Systems: Klein and Company Terrazzo
 - 3. Key Resin Company: Key Epoxy Terrazzo
 - 4. Terrazzo Masters

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
 - 1. Maintain the ambient room and floor temperature at 60°F or above for a period extending 72 hours before, during and after floor installation.
 - 2. Prior to and during each day of installation, verify that the dew point is at least 5°F less than the slab and air temperature
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
 - 1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.

PART 2 - PRODUCTS

2.1 EPOXY TERRAZZO

- A. Primer: As recommended by Epoxy Resin Supplier.
 - 1. Penetrating Epoxy Primer (Moisture Mitigation) Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH. Moisture Vapor Treatment must suppress a minimum of 90% Relative Humidity.
- B. Epoxy resin mixed according to manufacturers recommendation and tested without aggregate added. All specimens cured for 7days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2 R.H.

1. PROPERTY TEST METHOD REQUIREMENT

HARDNESS ASTM D-2240 using Shore D Durometer: 75 -85

TENSILE STRENGTH - ASTM D-638 run at .2" min.: 4,800 psi min.

COMPRESSIVE STRENGTH-ASTM D-695, Specimen B cylinder 12,000 psi min

CHEMICAL ASTM D-1308 -7 days at room temperature by
RESISTANCE immersion method have no deleterious effects.

The following contaminants used:

Distilled Water 1% Soap Solution

Mineral Water 10% Sodium Hydroxide

Isopropanol.....10% Hydrochloric Acid

Ethanol 30% Sulfuric Acid

.025 Detergent Solution 5% Acetic Acid

- C. Epoxy Resin mixed according to manufacturers recommendations and blended, ground and grouted with epoxy resin according to 3.02 C-2-Finishing to a nominal 3/8" thickness. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The finished epoxy terrazzo shall meet the following requirements:
 - 1. Flammability: When tested in accordance with ASTM-D-635, the Epoxy terrazzo shall comply with the following value: Self-extinguishing, extent of burning 0.25 inches maximum.
 - 2. Thermal Coefficient of Linear Expansion: when tested in accordance with ASTM-D-696, the

Epoxy terrazzo will comply with the following value: 25 x 10⁻⁶ inches per inch per degrees to 140 degrees Fahrenheit maximum. Temperature range -12 degrees to 140 degrees Fahrenheit.

3. Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 (Pages 1139-1141) the Epoxy terrazzo shall comply with the following value:

2. 100% concrete failure minimum, with 300 PSI minimum tensile strength..
2. Marble Chips: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 - d. Chips shall contain no deleterious or foreign matter.
 - e. Dust content less than 1% by weight

B. Mixes:

1. Mix epoxy components with aggregates in accordance with manufacturer's recommendations
2. Proportions: In accordance with resin supplier's recommendations.
3. Terrazzo Topping: Charge and mix marble chips, filler and epoxy resin in accordance with manufacturer's recommendations.
 - a. Formulated Mix Color and Pattern: 70% Georgia White #1, 30% Georgia White #0 (Terrazzo Masters SW #9165 Gossamer Veil).

2.2 STRIP MATERIALS

A. Standard Divider Strips: One-piece, L-angle strips.

1. Material: White-zinc alloy
2. Depth: match terrazzo thickness
3. Width: 16 gauge, unless otherwise indicated on the Drawings.

B. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation. Revise list below to suit Project.

1. Edge-bead strips for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: Adhesive recommended by manufacturer for this use.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Anchoring Devices:

1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.

- C. Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.
- D. Flexible Reinforcing Membrane for Substrate Crack Preparation and Reflective Crack Reduction: Flexible Epoxy Membrane. Reinforcement with fiberglass scrim.
- E. Sealer: acrylic or urethane terrazzo sealer

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates to produce clean, dry, and neutral substrate for terrazzo application.
 - 1. Remove substances, including oil, grease, and curing compounds, that might impair bond of terrazzo system.
 - 2. Prepare substrates before installing terrazzo system according to manufacturers written recommendations. Prepare concrete mechanically by shot blasting. Surface preparation results should achieve a CSP3-CSP5 profile according to International Concrete Repair Institute Guideline No. 03732
- B. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
- C. Flexible Reinforcing Membrane: Membrane Application for Isolated Cracking: Hairline cracks less than 1/16" width may be filled with neat epoxy resin,. Treat cracks larger than 1/16" width as recommended in NTMA Technical Bulletin #111 "Crack Detailing and Joint Treatments for Thin Set Terrazzo", Detail #6. Route out all cracks larger than 1/16" width and fill with rigid epoxy. Apply Flexible Epoxy across the crack a minimum width of 24 inches at a spread rate of 40-50 square feet per gallon to achieve 32-40 mils dry film thickness over the crack and allow to cure. Optional reinforcement: Apply Primer to cured membrane. Imbed fiberglass scrim cloth into wet primer and saturate with additional Primer. Alternatively, scrim cloth may be gently placed onto surface of tacky without pressing down into resin. Allow to cure. Allow for 10% of total terrazzo square footage in lineal feet of crack detailing

3.3 INSTALLATION, GENERAL

- A. Prime substrate and install terrazzo in strict accordance with manufacturers written recommendations for terrazzo and accessory installation.

- B. Place terrazzo mixture in panels formed by divider strips and trowel mixture to top of strips in strict accordance with the manufacturers printed instructions..
- C. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated
 - b. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install accessory strips as required to provide a complete installation.
- D. Finishing:
 - 1. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates. Follow initial grind with 80 or finer grit stones.
 - 2. Grouting: Cleanse terrazzo with clean water and rinse. Remove excess rinse water and hand apply grout using identical color as used in topping, taking care to fill voids. Cure Grout.
 - 3. Fine Grinding: Grind with 80 or finer grit stones until all grout is removed from surface. Upon completion, terrazzo shall show a minimum of 70% of marble chips.
 - 4. Apply sealer as recommended by sealer and epoxy floor manufacturers

3.4 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring.
 - 3. Wash surfaces with cleaner according to manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly. Owner will maintain the floors by the wet polish method.
- B. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SUSPENDED ACOUSTICAL CEILINGS

SECTION 09511

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system and perimeter trim.
- B. Acoustical panels as follows:
 - 1. **ACT-1:** 24"x24"x3/4" thick reveal edge acoustical ceilings panels in 9/16" slot reveal grid and shadow mold perimeter treatment.
 - 2. **ACT-2:** 24"x24"x3/4" thick reveal edge acoustical ceilings panels in 15/16" reveal grid

1.02 RELATED SECTIONS

- A. Division 15 : Air diffusion devices in ceiling system.
- B. Division 16: Light fixtures in ceiling system.

1.03 REFERENCES

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- C. ASTM E1264 - Classification of Acoustical Ceiling Products.
- D. Ceilings and Interior Systems Contractors Association Cisca - Acoustical Ceilings: Use and Practice.
- E. UL - Fire Resistance Directory and Building Material Directory.

1.04 SYSTEM DESCRIPTION

- A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.
- C. Product Data: Provide data on metal grid system components and acoustical units.

- D. Samples: Submit two samples full size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner and edge trim.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 QUALIFICATIONS

- A. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated assembly and combustibility requirements for materials.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F, 16 degrees C, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.10 SEQUENCING

- A. Sequence work under the provisions of Section 01010. .
- B. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- C. Install acoustical units after interior wet work is dry.

1.11 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide 5 percent of total acoustical unit area of extra panels to Owner.

PART 2 - PRODUCTS

2.01 METAL SUSPENSION SYSTEM MATERIALS

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable

ASTM C 635 requirements.

- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
 - 1. Corrosion Protection: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
- D. Wire Hangers, Braces and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106 inch (2.69 mm) diameter wire.
- E. Sheet Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
 - 1. For lay-in panels with reveal edge details, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- F. Steel Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished metal caps on flanges; other characteristics as follows:
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Cap Material and Finish: Steel sheet painted white, unless otherwise indicated.
 - 4. Face Width: 9/16" dimensioned grid system with 1'4" reveal slot equal to "Silhouette XL ¼" Reveal" by Armstrong at ACT-1, except 15/16" at ACT-2

2.02 MANUFACTURERS - ACOUSTICAL UNITS

- A. **Acoustical Panels:** ASTM E1264, Type IV, Form 2, Pattern E, Class 25 conforming to the following:
1. Size: 24 x 24 inches.
 2. Thickness: 3/4 inches.
 3. Composition: Wet formed mineral fiber with transparent membrane with factory-applied acrylic latex paint.
 4. Light Reflectance: .90 percent.
 5. NRC Range: .75
 6. CAC Range: 35
 7. Surface Burning Characteristics: Class A.
 8. Edge: Beveled Tegular for 9/16" and 15/16 grid as indicated on the drawings
 9. Surface Color: White, unless otherwise indicated on the drawings.
 10. Surface Finish: Smooth non-directional face equal to Ultima, Humiguard Plus" by Armstrong and "Mars ClimaPlus" by U.S.G.
 11. Warranty: 30 years with no visible sag at 104 degrees F/95% relative humidity and growth of mildew, mold and bacteria

2.03 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636 manufacturer's instructions and as supplemented in this section.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
1. Space hangers not more than 16" at end and 48" between each runner.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- E. Supply hangers or inserts for installation to Section with instructions for their correct placement.

- F. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
- G. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- H. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three (3) tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- I. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- J. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- K. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- L. Do not eccentrically load system, or produce rotation of runners.
- M. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
 - 1. Screw attach moldings to substrate at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- N. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- O. Form expansion joints as detailed. Form to accommodate plus or minus 1-inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
- C. Install units after above ceiling work is complete.
- D. Install acoustical units level, in uniform plane, and free from twist, warp and dents.
- E. Cut panels to fit irregular grid and perimeter edge trim.
- F. Install hold-down clips to retain panels tight to grid system within 20 ft of an exterior doors.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SUSPENDED METAL GRATE CEILINGS**SECTION 09512****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. Section includes custom fabricated suspension ceiling grid including aluminum grid frame, lateral bracing and hanger rods, and aluminum grate ceiling framed panels bolted to suspended aluminum grid frame. All components shall be mill finished aluminum (no applied finishes). See drawing for grating specifications and suspension members

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 2. ASTM A 1008 "Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"5.
 - 3.. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- A. ASTM B211 - Aluminum-Alloy Bars, Rods, and Wire.
- B. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
- C. ASTM B241 - Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
- D. ASTM B483 - Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
- E. AWS D1.1 - Structural Welding Code

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified ceiling panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross grid.
- C. Shop Drawings: Layout and details of grid, suspension system and metal grate ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide panel units and grid components by a single manufacturer.

- C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
- D. Metal Bar Grating Standards. Comply with applicable requirements as listed below.
 - 1. Non-Heavy Duty Metal Bar Gratings Comply with NAAMM MBG 531, “Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads
- E. Welding. Manufacturer to utilize quality shop welding procedures according to AWS Structural Welding Code Guidelines
- F. Design and size components including suspension frames, hanging rods and lateral bracing to withstand dead loads and live loads caused by positive and negative wind loads of 10 mph acting normal to the plane of ceiling panels in accordance with ASCE 7, code requirements. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver 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 ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle ceiling units carefully to avoid chipping edges or damaged units in any way.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ohio Grating Co or equal for grate; custom fabrication of required components indicated on the drawings.

2.2 CEILING UNITS

- A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper for extruded structural framing members.
- A. Sheet Aluminum: ANSI/ASTM B209; alloy and temper suitable for use.
- B. Fasteners: Non-magnetic stainless steel or aluminum or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable
- D. Pattern: See drawing for grate component sizes and spacing.

2.3 FABRICATION

- A. Provide thickness of framing members as necessary to comply with the structural loading requirements.
- C. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- D. Accurately fit and secure joints and corners. Make joints flush and hairline,
- E. Prepare components to receive bolted anchor devices.
- F. Arrange fasteners and attachments in straight rows in consistent alignment with other components.
- G. Reinforce framing members for imposed loads.

2.4 SUSPENSION SYSTEMS

- A. Components: Angle frames, hanging rods and lateral bracing, base metal and end detail, fabricated from extruded aluminum complying with ANSI/ASTM B221.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, , plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- A. Install suspension system and panels in accordance with the manufacturer's installation instructions, shop drawings and specified performance.
- B. Lay out system to a balanced grid design as indicated on the drawings.
- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Supply hangers or inserts for installation to Section with instructions for their correct placement.
- E. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
- F. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support suspension system

members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- G. Connect hangers either directly to structures or to inserts, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- H. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- I. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related framing to span the extra distance.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- K. Do not eccentrically load system, or produce rotation of grid frame.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of ceilings, including trim, moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees

END OF SECTION

TECTUM ACOUSTICAL PANELS (DIRECT ATTACHMENT)**SECTION 09521****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. 1" thick cement fiber panels, factory finished of color selected by the Architect, direct fastening to 16 gauge furring channels, with fastener heads factory painted to match panels.

1.02 QUALITY ASSURANCE

- A. Provide units manufactured by a single firm specializing in the production of this type of work.

1.03 PERFORMANCE RATINGS

- A. Fire Performance: The composite panel shall have a flame spread rating of 25 or less and a smoke developed rating of 65 or less with manufacturers' standard facing. Panels shall be rated Class A as defined by ASTM E84.
- B. Cement Fiber Panels (Tectum): Provide acoustical wall panel system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) rating as follows, using Type A direct mounting, ASTM C423 : NRC = 0.40

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit two (2) copies of manufacturer's product specifications and installation instructions, including maintenance instructions.
- B. Samples: Submit two (2), 12" x 12" sample of each color and texture of facing required. Review will be for color, pattern, and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.
- C. Shop Drawings: Submit shop drawing showing panel layout in Plans and Elevations at a minimum 1/4" per ft. scale; also include installation details.

1.05 PRODUCT HANDLING

- A. Deliver materials wrapped in Kraft paper and packaged in cartons. Protect all panel corners. Store in a dry, well-ventilated area protected from the water, undercover and off the ground.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install acoustical panels until building is closed in and HVAC system is operational.
 - 2. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.
 - 3. Maintain the following conditions in areas where acoustical materials are to be installed 24 hours before, during and after installation:

- a. Relative Humidity: 65 - 75%.
- b. Uniform Temperature: 55 - 70 degrees F (13 - 21 degrees C).

PART 2 - PRODUCTS

2.01 ACOUSTICAL WALL PANEL

- A. Cement Fiber Panels: High impact resistant cement fiber acoustical panels, Aspen wood fibers bonded with inorganic hydraulic cement, complying with Fed. Spec. SS-S-118 with square edges and factory finished with manufacturers standard paint finish equal to "Tectum" panels. When tested in accordance with ASTM C423, panels shall provide an NRC of .40 for specified mounting system. Panels shall be 1 inch thick with long edges beveled.
 - 1. Screws: Painted (match panels) head S12 screws of length to fully penetrate the indicted substrate
 - 2. Factory paint panels and fastener heads of color selected by the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's printed instructions and recommendations which are applicable to the work indicted. Install units plumb and level with butt joints.
- B. Mechanical Screw Application: Screw head to be flush with panel surface. Securely affix panels.

3.02 CLEANING

- A. Upon completion of this portion of the work, promptly clean exposed portions and remove traces of dirt, grease and foreign materials.
- B. Upon completion of the installation, visually check exposed surfaces of the work of this section, and touch up scratches and abrasions so as to be completely invisible to the unaided eye from distance of 5 feet.

END OF SECTION

ACOUSTICAL BOARDS

SECTION 09525

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Black color mat faced acoustical duct liner boards, of thickness indicated on the drawings, applied to overhead deck above open metal grille ceilings, where indicated on the drawings. Install with adhesive and metal impaling clips

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Systems

1.03 REFERENCES

- A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.04 PERFORMANCE REQUIREMENTS

- A. Surface Burning: ASTM E84 with a flame spread/smoke developed rating of 10/250.

1.05 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance and limitation criteria.
- B. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the work of this Section by manufacturer.

1.07 MOCK UP

- A. Job Mock-Up: Prior to installation of spray-on system work, erect sample panel mock-up using materials,) shown or specified for final work. Provide special features as directed for contiguous work. Build mock-up at the site, where directed, of full thickness indicating the proposed range of color, texture and workmanship to be expected in the completed work. Obtain Architect's acceptance of visual qualities of the mock-up before start of the work. Provide mock-up panel for duct liner construction.
 - 1. Retain mock-up during construction as a standard for judging completed work. Do not alter, move or destroy mock-up until work is completed. Provide mock-up panel for face brick construction

PART 2 - PRODUCTS

2.01 BLACK MAT FACED DUCT LINER ACOUSTICAL BOARDS

- C. Black fiberglass or cotton duct liner for use in architectural applications shall be 2" thick, as indicated on the drawings. It shall be installed as shown on the drawings and herein specified.
- D. Black fiberglass or cotton duct liner for use in architectural applications shall be fiberglass or cotton insulation with a black mat surface acrylic coating without manufacturer's markings. This coating shall be damage resistant, not tearing or abrading easily. Black fiberglass or cotton duct liner shall be supplied in board with a minimum density of 1.5 lb/ft³ and a maximum density of 3 lb/ft³. Fiberglass or cotton duct liner, facing and adhesives shall comply with ASTM E-84 and shall have a maximum flame spread rating of 25 and smoke rating of 50.
- E. Black fiberglass or cotton duct liner shall conform to ASTM C 423 standard "Sound Absorption" and have the following minimum sound absorption coefficients when tested in accordance with ASTM C423 and E795 procedures mounting type "A":

	Octave Band Center Frequency, Hz.						
	125	250	500	1000	2000	4000	NRC
1" thick	0.05	0.25	0.61	0.89	0.92	0.96	0.70
2" thick	0.17	0.73	1.05	1.02	0.95	0.96	0.95

- F. Duct Lining: The following are acceptable, subject to the above performance requirements:
 1. Select Sound Black Acoustic Board from Owens Corning Fiberglas Corporation, Toledo, OH 419-248-8000 (Note: this product is a black/grey fiberglass core with a black scrim facing.)
 2. AcoustaBlanket Black CertainTeed, Valley Forge, PA 610-341-7000 (Note: this product is a black/grey fiberglass core with a black scrim facing.)
 3. Permacote Linacoustic Standard from Johns Manville Corporation, Denver, CO 800-654-3103 (Note: this product is a black/grey fiberglass core with a black facing)
- G. Adhesives: 15-141 from King Co., St. Louis, MO (314) 772-9953
Tuffbond from Goodloe E. Moore, Inc., Danville, IL, (800) 331-1164
INC C-700 from Industrial Noise Control, Inc., Addison, IL, (312) 620-1998
- H. Mechanical Fasteners: Gemco Type IH-A from Goodloe E. Moore, Inc., Danville, IL, (800) 331-1164
Eckoustic-Klip from Eckel Industries, Inc., Cambridge, MA, (617) 491-3221
INC Stick-Pin from Industrial Noise Control, Inc., Addison, IL, (312) 620-1998

PART 3 - EXECUTION

3.01 EXAMINATION/COORDINATION

- A. Verify that opening and partition work are ready to receive the Work of this section.
- B. Coordinate with the work of other trades affecting the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of acoustical material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material migration.

3.03 ACOUSTICAL BOARDS

- A. Provide board insulation at walls as indicated on the Drawings. Adhered by 100% covering of a fire retardant adhesive. The black mat face shall face the room. Use non-ferrous mechanical fasteners in addition to 100% adhesive coverage.

3.04 CLEANING

- A. Clean adjacent surfaces of acoustical materials.

END OF SECTION

RESILIENT BASE**SECTION 09650****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Resilient base.

1.02 REFERENCES

- A. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/fuel/smoke rating requirements in accordance with ASTM E84.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns and colors available.
- C. Submit samples under provisions of Section 01300.
- D. Submit two 3 inch long samples of base material for each color specified.
- E. Submit manufacturer's installation instructions under provisions of Section 01300.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit cleaning and maintenance data under provisions of Section 01700.
- B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

- A. Base: ASTM F 1861, Type TS, Group 1(solid), Thermoset vulcanized 100% vulcanized homogenous synthetic rubber compound synthetic rubber, 4 inch; full 1/8 inch thick; top set cove unless otherwise indicated on the drawings; ribbed back; matte finish of color selected by Architect.
 - 1. 120' coiled lengths for field formed corners.
 - 2. See drawings for product selections and colors.
- B. Base Accessories: Same material, size, and color as base.
- C. Manufacturers: Johnsonite, Roppe Corp., Flexco, Allstate by Stoler Industries and Burke Industries

2.01 ACCESSORIES

- A. Primers and Adhesives: Waterproof; types recommended by base manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Beginning of installation means acceptance of existing substrate and site conditions.

3.02 PREPARATION

- A. Apply primer if recommended by adhesive manufacturer.

3.03 INSTALLATION - BASE MATERIAL

- A. Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is indicated.
- B. 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.
 - 1. On Masonry surfaces, or other similar irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Install inside and exterior corners before installing straight pieces.
- D. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.

- E. Field form all external corners by wrapping in strict accordance with manufacturer's printed instructions with minimum of 12" returns.
 - 1. Form outside corners on job from straight pieces of maximum lengths possible by shaving or scoring the back of base at point where bending will occur. Remove a strip perpendicular to length of base and score only deep enough to produce a snug fit without removal of more than half the thickness of wall base.
- F. Fit joints tight.
- G. Install base on solid backing.
- H. Scribe and fit to door frames and other interruptions.
- I. Cut wallcovering as required to prevent base adherence to wallcovering surface.
- J. Prohibit traffic on floor finish for 48 hours after installation.

3.04 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

END OF SECTION

RESINOUS FLOORING SYSTEM**SECTION 09670****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Resinous Systems of the Following Types:
 - 1. Moisture mitigating coat, epoxy build coat and urethane top coat with broadcast traction aggregate of colors indicated on the drawings

1.2 RELATED SECTIONS

- A. Section 03300 – Cast-In-Place Concrete.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C 413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 2. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 3. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 - 4. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
 - 5. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - 6. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
 - 7. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 - 8. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
 - 9. ASTM D 2370 - Standard Test Method for Tensile Properties of Organic Coatings.
 - 10. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 - 11. ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 12. ASTM D 4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
 - 13. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
 - 14. ASTM D 7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 15. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 16. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
 - 17. ASTM G 154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

- B. Deutsches Institute fur Normung (DIN):
 - 1. DIN 53460 – Testing of Plastics; Determination of the Vicat Softening Temperature of Thermoplastics.
- C. International Concrete Repair Institute (ICRI):
 - 1. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- D. Military Specifications (MIL):
 - 1. MIL-D-3134J - Deck Covering Materials.
- E. National Floor Safety Institute (NFSI):
 - 1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used, including properties, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
- C. Verification Samples: Two representative units of each system, including color and texture.
- D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Manufacturer's Project References: Submit manufacturer's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.
- G. Applicator's Project References: Submit applicator's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.
- H. Care and Maintenance Instructions: Submit manufacturer's care and maintenance instructions, including cleaning instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

- B. Applicator's Qualifications:
 - 1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
 - 2. Employ persons trained for application of resinous flooring systems.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 - 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 - 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 - 3. Retain mock-up during construction as a standard for comparison with completed work.
 - 4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until application.
 - 3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
 - 4. Store materials out of direct sunlight.
 - 5. Keep materials from freezing.
 - 6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

- A. Apply flooring system under the following ambient conditions:
 - 1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
 - 2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
 - 3. Relative Humidity: Maximum 80 percent.
 - 4. Dew Point: Floor temperature more than 5 degrees over dew point.
- B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

1.9 WARRANTY

- A. Submit manufacturer's standard warranty. The warranty is for a period of one (1) year from the date of delivery, and it is a material warranty that the products will be free from manufacturing defects

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: The Sherwin-Williams High Performance Flooring, 866-540-1299 swflooring@sherwin.com Website: <https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html>

2.2 RESINOUS FLOOR

- A. Resuflor Performance HTS.
 - 1. Primer Coat: Resuflor MVB Moisture -Mitigating primer, 3-5 mils. thickness depending on results of ASTM F2170)
 - 2. Build Coat: Resuflor MPE, 10-13 mils., 8-12 DFT
 - 3. Topcoat: Resutile HTS 100, 3 mils., 2.75 DFT
 - 4. Colors: As selected by Architect from manufacturer's full range.

2.3 SYSTEM PROPERTIES

- A. Resuflor Performance HTS
 - 1. Abrasion Resistance Taber Abraser CS-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060, 18 mg/loss
 - 2. Adhesion to Concrete, psi (MPa), ASTM D4541, 450 [3.10] (concrete failed)
 - 3. Adhesion to concrete, psi [MPa], ASTM D7234, 732[4.48] (concrete failed)
 - 4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047, 0.63
 - 5. Coefficient of Friction-Wet Static, BOT 3000, ANSI/NFSI B101.1, 0.94
 - 6. Compressive Strength, psi [MPa], ASTM D695, 13,500 [93.08]
 - 7. Flammability, mm/min, ASTM D635, 182
 - 8. König Hardness 93 mil/0.08 mm film), ASTM D4366, 171.3
 - 9. Resistance to Yellowing as measured using ASTM D2244 after 1000 consecutive hours UV exposure in QUV, ASTM G154, <10 increase of yellow units (CIE Lab Δ) if pigmented topcoat
 - 10. Shore D Hardness, ASTM D2240, 80-85 @ 0 sec|75-80 @ 15 sec
 - 11. Tensile Strength, psi [MPa], ASTM D2370, 6,250 [43.09]
 - 12. Percent Elongation, ASTM D2370, 6%
 - 13. Volatile Organic Compound, VOC lb./gal [g/l], ASTM D3960, Resuflor MPE A+B=0.41 [49] Resutile HTS 100 A+B=0.05 [6]
 - 14. Water Absorption, 24- hour immersion, ASTM C413, 0.2% weight increase

2.4 PRODUCT PROPERTIES

- A. Resuflor MPE: A neutral, two-component, high solids epoxy.
 - 1. Percent Solids, by weight (by volume), ASTM D1475, A + B: 95.45 (94.56).

2. Volatile Organic Compound-VOC, ASTM D3960, Mixed A + B: 0.41 lb./gal (49 g/L).
 3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060: 83.1.
 4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.59-0.62.
 5. Adhesion to Concrete, ASTM D5441: 732 psi (4.48 MPa) concrete failed.
 6. Adhesion to Concrete, ASTM D7234: 450 psi (3.10 MPa) concrete failed.
 7. Compressive Strength, ASTM D695: 13,500 psi (93.079 MPa).
 8. Tensile Strength, ASTM D2370: 8,000 psi (55.158 MPa).
 9. Percent Elongation, ASTM D2370: 5.
 10. Shor D Hardness, ASTM D2240: 80-85 at 0 sec, 75-80 at 15 sec.
- B. Resutile HTS 100: A clear high solids, three-component, satin finish, aliphatic, moisture-cure urethane.
1. Percent Solids, by weight (by volume), ASTM D2369, A + B + C: 94.02 (92.57).
 2. Volatile Organic Compound-VOC, ASTM D3960, Mixed A + B + C: 0.05 lb/gal (6 g/L).
 3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 gram load, 1,000 revolutions, ASTM D4060: 18.
 4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.63.
 5. Wet Static Coefficient of Friction, BOT 3000, ANSI/NFSI B101.1: 0.94.
 6. Flammability, ASTM G154: 182 mm/min.
 7. Resistance to Yellowing as measured using ASTM D2244 after 1000 consecutive hours UV exposure in QUV, ASTM G154, Less than 10 increase of yellow units (CIE Lab Δb)
 8. Tensile Strength, (resin only), ASTM D2370: 6,250 psi (43,092 MPa).
 9. Percent Elongation, (resin only), ASTM D2370: 6.
 10. König Hardness, (3 mil/76.2 micron film), ASTM D4366: 171.3.
 11. Water Absorption, 24-hour immersion, ASTM C413: 0.2 percent weight increase.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine concrete surfaces to receive flooring system. Verify concrete is structurally sound.
- B. Moisture Testing of Concrete: Perform at least one of the following two tests to determine moisture in concrete. Type of test and frequency as recommended by manufacturer and installer.
 1. In-situ Probe Test:
 - a. Measure relative humidity in concrete in accordance with ASTM F 2170.
 - b. Application of flooring system shall start only if test results are below 75 percent relative concrete humidity.
 - c. If test results are above limits, notify Architect and flooring manufacturer in writing.
- C. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide flooring manufacturer's recommended moisture vapor control coating if required.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with flooring system materials.
- C. Surface Preparation:
 - 1. Prepare concrete surface in accordance with manufacturer's instructions.
 - 2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of flooring system.
 - 3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
 - 4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
 - 5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's instructions.
 - 6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
 - 7. Joints: Fill joints in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install flooring system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.
- B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.
- C. Allow concrete to cure a minimum of 7 days before applying flooring system.
- D. Mixing:
 - 1. Mix material components together in accordance with manufacturer's instructions.
 - 2. Mix only enough material that can be applied within working time.
 - 3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.
- E. Apply flooring system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.
- F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.
- G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.
- H. Cove:
 - 1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - 2. Apply cove to height and shape as indicated on the Drawings.
 - 3. Apply cove to create seamless, smooth transition between flooring and walls.
- I. Seal Coat:

1. Apply seal coat in accordance with manufacturer's instructions.
2. Apply seal coat over traction aggregate.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

- A. Allow flooring system to dry in accordance with manufacturer's instructions before opening to traffic.
- B. Allow flooring system to dry a minimum of 1 week before cleaning by mechanical means.
- C. Protect completed flooring system from damage during construction.

END OF SECTION

CARPET**SECTION 09688****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Carpet tiles installed with glue-down installation method complete with all accessories. **Note: All carpet shall be laid out off-site for the required time to off-gas the carpet product prior to delivery to the site and installation.**

1.02 SUBMITTALS

- A. Submit manufacturer's installation instructions under provisions of Section 01300.
- B. Submit seaming plan, method of joining seams, direction of carpet with the following criteria:
 - 1. All carpet shall be laid in the same direction unless specifically shown otherwise.
 - 2. Seams which occur at doorways and entries shall not be perpendicular to doors or entries. Seams occurring at doors and parallel to doors shall be centered directly under the door.
 - 3. Seams occurring at corridor change of direction shall follow wall line parallel to carpet direction.
- C. Provide product data on specified products, describing physical characteristics; sizes, patterns, colors available, adhesive with written recommendation from the carpet manufacturer, MSDS sheets on adhesive, and method of installation.
- D. Submit two (2) samples 24 x 24 inch in size illustrating color and pattern for each carpet material specified.
- E. Submit manufacturer's installation instructions under provisions of Section 01300.

1.03 OPERATION AND MAINTENANCE MANUAL

- A. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and shampooing.

1.04 EXTRA MATERIALS

- A. Overrun Stock: Deliver overrun stock and scraps of unused carpet to Owner's attic stock, as directed by the Owner, in accordance with specified requirements.
 - 1. Provide 5% of total area of each type of uncut carpet delivered to Owner for attic stock.

1.05 QUALITY ASSURANCE

- A. Warranty: Submit manufacturer's warranty to provide replacement of carpet.

- B. Installer: Company with five years minimum documented successful experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for carpet flammability requirements.
- B. Conform to ANSI/ASTM E648.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- B. Maintain minimum 70 degrees F ambient temperature three days prior to, during, and 24 hours after installation of materials.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. **Carpet Tiles:** See Drawings and as follows:

Flammability: Passes
DOC-FF-1-70 Pill Test:

NBS Smoke Chamber NFPA-258: Less than 450 Flaming Mode

2.02 ACCESSORIES

- A. Sub-Floor Filler: premix cementitious equal to Dependable Chemical Company, Inc.
- B. Primers and Adhesives: Waterproof; Moisture mitigating type for concrete substrates with up to 99% in-situ RH (per ASTM F2170), and a pH between 8.0- 12.0., as recommended by flooring manufacturer..
 - 1. Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation, . environmental standards for VOC content and fume emission with strength and performance equal to "premium" solvent based adhesives
- C. Edge Strips: Roppe Rubber Model 38, rubber, color as selected.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft. and are ready to receive work.
- B. Beginning of installation means acceptance of existing substrate and site conditions.
- C. Verify that sub-floor surfaces are ready for flooring installation by testing moisture emission rate and alkalinity, in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by the flooring manufacturer and adhesive materials manufacturer. Reference ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. If test indicated slab is not in conformance provide moisture mitigating coating as required not to affect warranty. Test slab using ASTM F1869 when carpet has breathable backing, and ASTM F2170 for carpet with non-breathable backing.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to leave smooth, flat, hard surface at unusual depressions and at edges of marble flooring where feathering is required.
- C. Prohibit traffic until filler is cured.
- D. Vacuum floor surface.
- E. Apply cementitious filler (flash-patch) at gouges in the concrete slab and at all changes in flooring from carpet to any other finishes so as to bring the top of the carpet up to the top of the other finish. Fill, level and make smooth cracks 1/16 inch or more, holes, unevenness, and roughness with compatible latex floor patching compounds. Feather floor filling or leveling compound a minimum of four (4) ft. Sweep floor of loose granular debris prior to filling. After filling, allow filler to dry. Damp mop floor with warm water and allow to dry. Vacuum after mopping to ensure that loose granular debris is removed and to provide a proper substrate to install carpet. Prohibit traffic until filler is cured.
- F. Remove sealers, grease, loose particles, dirt and all other foreign substances. Subfloor shall be level and smooth. Concrete floors shall have dust thoroughly removed by sweeping and wet mopping

3.03 INSTALLATION

- A. Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions. Install carpet over entire area to be carpeted.
- B. Apply carpet and adhesive in accordance with manufacturer's printed instructions using the glue down method. Carpet seams and edges shall be tightly attached, eliminate air pockets, and roll to ensure uniform bond everywhere.
 - 1. Installed carpet tiles shall not set in adhesive to cause a permanent bond
 - 2. Blend carpet tiles from different cartons to ensure minimal variation in color match.
 - 3. Lay out each room or area to minimize tiles less than one half size

- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true and unfrayed.
- E. Locate seams to minimize the number of seams and in area of least traffic; individual offices shall not have seams.
- F. Fit seams straight, not crowded or peaked, free of gaps.
- G. Lay carpet on floors with run of pile in same direction as anticipated traffic.
- H. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.
- I. Cut and fit carpet around interruptions.
- J. Fit carpet tight to intersection with vertical surfaces without gaps.

3.04 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Remove any spots or smears of adhesive from carpet and other surfaces with an approved cleaning agent.
- C. Vacuum carpet surfaces several times using a commercial beater-bar-type vacuum cleaner or equivalent machine.
- D. Remove any protruding face yarns with a sharp scissors.

3.05 PROTECTION

- A. Prohibit traffic from carpet areas 24 hours after installation.
- B. Deliver specified attic stock and overrun and usable scraps of carpet to Owner's designated storage space, properly packaged and identified

END OF SECTION

ELASTOMERIC COATINGS**SECTION 09800****PART 1 - GENERAL****1.01 SUMMARY**

- A. Application of special elastomeric exterior coating system to all exterior plaster soffits, including preparation of the surface, prime coats and topcoats of all surfaces.
 - 1. The coating manufacturer's representative must submit written verification on manufacturers letterhead that after the cleaning the substrate was inspected and found acceptable for the coating application, consistent with requirements for the specified warranty. The aforementioned verification must be received before starting the coating application
- B. Types of special coating systems required for the project include:
 - 1. Pigmented, emulsion type, flexible, breathable, elastomeric, high build, waterproof acrylic coating. Priming system designed for compatibility with substrates indicated.
- C. General painting is specified in Section 09900.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including basic materials analysis and application instructions for coating material specified.
 - 1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
- B. Samples: Submit samples for review of colors and texture only. Provide a list of material and application for each coat of finish sample.
 - 1. Provide samples of material to be applied, with colors and texture to simulate samples as requested until the required sheen, color and texture is achieved to match existing concrete building.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers produced by the same manufacturer as the finish coats. Use only thinners recommended by the manufacturer, and only within recommended limits.
- B. Applicator: A firm with not less than 10 years of successful experience in application of special coating types required on substrates similar to those of this project.

- C. Coordination of Work: Ensure compatibility of the total systems for various substrates. Upon request, furnish information on characteristics of specified finish materials, to ensure that compatible prime coats are used.
 - 1. Solvent strength shall not effect bond.
 - 2. Notify the Architect of problems anticipated using the coatings systems specified.
- D. Field Samples: On actual surfaces using the same equipment for general application duplicate coating finishes of prepared samples. Sample surfaces shall be cleaned of dirt, grease, rust, concrete dust or other foreign material that will interfere with optimum bond. Provide full-coat finish samples on at lest 100 sq. ft. of surface, until required sheen, color, and texture are obtained.
 - 1. Final acceptance of colors will be from job applied samples.
 - 2. The Architect will select surface to represent surfaces and conditions for each type of coating and substrate to be coated. Apply coatings on this surface as specified. After finishes are accepted, this surface will be used for evaluation of coating systems of a similar nature.
- E. Material Quality: Provide the best quality grade of the coating as regularly manufactured by acceptable coating manufacturer. Materials not displaying manufacturer's identification as a best-grade product will not be acceptable.
- F. Warranty: Provide a manufacturer five (5) year written limited warranty for Special Coatings to protect against water penetration, blistering and peeling and to maintain vapor permeability signed by both the coating manufacturer and the applicator.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label and the following information.
- B. Name or title of material.
 - 1. Manufacturer's name, stock number and date of manufacture.
 - 2. Contents by volume, for major pigment and vehicle constituents.
 - 3. Thinning instructions.
 - 4. Application instructions.
 - 5. Color name and number.
 - 6. Handling instructions and precautions.
- C. Store materials not in actual use in tightly covered containers above ground at a minimum ambient temperature of 45 deg. F., in a well ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
 - 1. Protect from extreme heat and freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary precautionary measures to ensure that workmen and work ares are adequately protected from fire hazards and health

- hazards resulting from handling, mixing and application of coatings.
- 2. Do not store or use materials that are over six (6) months old.

1.05 PROJECT CONDITIONS

- A. Apply coatings only when the temperature of surfaces to be coated and surrounding air temperatures are above 40 deg. F. or below 95 deg. F., unless otherwise permitted by manufacturer's printed instructions.
- B. Do not apply coatings in snow, rain, fog or mist, or when there is a chance of rain within 24 hours after application, or at temperatures less than 40 deg. F. or to damp or wet surface unless otherwise permitted by manufacturer's printed instructions. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing the coating operation. Protect surfaces from rain for 48 hours after application.
 - 1. Test surfaces with moisture meter prior to application of coatings and only proceed with application if readings are within limits of coating manufacturer requirements.
- C. Apply coatings in areas away from sparks or spark producing equipment. Do not use near fire, flame or heat; primer material is combustible. Avoid breathing.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Neogard
 - 2. Sonneborne
 - 3. Thoro Systems Products
 - 4. Tnemec
 - 5. MAPEI

2.02 EXTERIOR COATING MATERIALS

- A. Exterior Primers: Provide factory pigmented formulated prime coat material compatible with the substrate and finish coats indicated.
- B. Finish Coats: Provide factory formulated, finish coat material compatible with the substrate and primer. Pigmented, emulsion type, flexible, elastomeric, high-build, waterproof acrylic coating for application over all specified and primed surfaces:
 - 1. NeoFlex Waterproof Elastomeric Coating System by Neogard
 - 2. Colorflex; Sonneborne
 - 3. Thorolastic by Thoro Systems Products
 - 4. 156 Enviro - Crete by Tnemec

5. Elastocolor Flex- MAPEI
 6. Colors shall be selected by the Architect and allow for three (3) colors being required.
- C. Miscellaneous Materials: Provide materials not specifically described, but required for complete and proper performance of the work and as recommended by the manufacturer of the special coatings. All materials must be compatible with the products in this specification section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which coating will be performed for compliance with requirements for application of coatings. Do not proceed with application until unsatisfactory conditions have been corrected.
1. Start of coating work will be construed as the Applicator's acceptance of surfaces within particular area.

3.02 PREPARATION

- A. Surface Preparation: Perform surface preparation repairs and cleaning in compliance with the manufacturer's instructions for the particular substrate conditions, and as specified in another section of these specifications prior to applying special coatings.
1. All caulking and sealants shall be thoroughly cured prior to application of special coatings. Surfaces to receive special coatings shall be dry. Notify the Architect in writing of anticipated problems using coatings specified with substrates primed or furnished by others.
- B. Material Preparation: Carefully mix and prepare materials in compliance with the coating manufacturer's directions.
1. Mix materials before application to produce a mixture of uniform density, and as required during application. Do not stir film, which may form on surfaces, into the material. Remove film and, if necessary, strain the coating material before using.

3.03 APPLICATION

- A. Test Application: Prior to general application of special coatings prepare a small application in an unobtrusive location for the purpose of demonstrating final effect of installation. Proceed with work only after Architect's acceptance of test application.
- B. Apply special coatings by brush and roller applicators in accordance with manufacturer's directions. Use brushes best suited for the material being applied. Use rollers as recommended by the manufacturer for the material and texture required.

1. Provide finish coats compatible with the primers used.
 2. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer.
- C. Minimum Coating Thickness: Apply each material at not thinner than the manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by the manufacturer but not less than 8 dry mils per coat.
- D. Primer: See precautions at beginning of this section regarding combustibility.
1. Apply product as packaged - do not dilute or alter the material.
 2. Apply sufficient material, to thoroughly wet the masonry surface. Avoid heavy streaks and runs. Brush out drips and runs that do not penetrate.
 3. Allow surface to dry twenty-four (24) hours prior to application of pigmented elastomeric acrylic polymer masonry coating.
 4. Protect treated surface from rain for a period of at least twenty-four (24) hours after application.
- E. Pigmented Elastomeric Acrylic Polymer Finish Coating (Two Coats):
1. Apply product in its concentrated form and dry mil thicknesses in accordance with manufacturer's written instructions to obtain uniform pinhole free surface.
 2. Apply first coat to primed surface with roller. Use sufficient material to thoroughly cover surfaces with continuous coating.
 - a. Back-brush to ensure complete coverage.
 - b. Work coating into surface.
 3. Allow first coat to dry twenty-four (24) hours prior to application of second coat.
 4. Apply second coat over first coat following same application procedure as first coat (roller and back-brush) to provide a uniform, monolithic appearance with no ridges, brush strokes, runs, etc.
 5. Allow second coat to dry forty-eight (48) hours before proceeding with additional work, if required, on surface.
 6. Protect freshly coated surface from rain for a period of at least three (3) hours after application.
- F. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or recoat work not in compliance with specified requirements.

3.04 CLEANING

- A. Clean-Up: At the end of each work day, remove rubbish, empty cans, rags and other discarded materials from the site.

3.05 PROTECTION

- A. Protect work of other trades, whether to be coated or not, against damage from coatings.

Correct damage by cleaning, repairing, replacing, and recoating as acceptable to the Architect. Leave in an undamaged condition.

1. Protect surfaces from splash and overspray of primer.
 2. Remove inadvertent primer splashes immediately according to manufacturer's written instructions.
 3. Cover live plant materials with drop cloths.
- B. Provide "Wet Paint" signs to protect newly-coated finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of coating operations.
1. At completion of construction activities of other trades, touch-up and restore damaged or defaced coated surfaces.

END OF SECTION

PAINTING**SECTION 09900****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation and field application of primers and finish paints and coatings.
- B. Paint all exposed surfaces not prefinished under other sections of the specification and whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. Without restricting the extent of the work to be performed the work shall include, but not limited to, finishing of the following new and existing interior and exterior exposed surfaces:
 - 1. Wood: Plywood wainscot.
 - 2. Structural Steel: Touch-up new steel after erection and all new and existing overhead steel framing and deck with dryfall paint system. All new and existing items require priming. Protect acoustical boards and tectum panels against painting of structure.
 - a. premium grade metallic product color matching Centria “XL Silver - Sundance Series 9957”
 - b. Semi-gloss
 - 3. Mechanical and Electrical Items: All exposed overhead metal duct work, conduit, piping etc. with dryfall paint system. All new and existing items require priming. Protect acoustical boards and tectum panels against painting of mechanical and Electrical Items.
 - a. Do not paint fabric ducts.
 - 4. Ferrous Metal: All ferrous metal work, including galvanized, both exterior and interior of building (which is not finished painted under other sections) as follows: doors, frames, railings, stair framing, bollards (primer and apply 2 finish coats of paint) and miscellaneous metal fabrications.
 - a. premium grade metallic product color matching Centria “XL Silver - Sundance Series 9957”
 - b. Semi-gloss.
 - 5. Masonry: New and existing exposed masonry. Semi-gloss.
 - 6. Gypsum Drywall: All exposed new and existing surfaces of walls and ceilings.
 - a. Overhead (if any): Flat
 - b. Walls: Eggshell
 - 7. Plaster : Exterior soffits receive elastomeric coating specified in Section 09800.
 - 8. Acoustical Treatments: Duct liner boards above metal ceilings, factory finished Black in Section 09525, except field painting is required of all exposed fasteners/clips installed for attachment of the duct liner boards.

9. Traffic Marking: Traffic zone marking paint complying with Fed. Spec. TT-P-115, Type III (15 wet mils), equal to Sherwin Williams "Set Fast Chlorinated Rubber of color selected by the Architect., with 4" wide stripes, unless otherwise indicated

1.02 RELATED SECTIONS

- A. Section 06410 - Architectural Woodwork: Factory finished millwork.
- B. Section 08200 - Wood Doors: Factory finished doors.
- C. Section 09260 - Gypsum Board Systems: Drywall finishing.
- D. Factory primed items.

1.03 REFERENCES

- A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.
- C. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.
- D. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.
- E. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.04 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Submit for each paint system specified, including block fillers, primers and finish coatings.
 1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification with heading indicating surfaces to be finished corresponding to the Paint Schedule herein.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC).

- C. Submit samples for initial color selection in the form of manufacturer's color charts.
 - 1. After color selection, the Architect will furnish manufacturer color numbers and/or color chips of another manufacturer to match for surfaces to be coated.
- D. Submit Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, or representative samples of the actual substrate.
 - 1. Provide stepped samples, defining each separate coat, including block fillers and primers for masonry coatings. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of material and application for each coat of each sample. Label each sample as to surface, location and application.
 - 3. Submit samples on the following substrates for the Architect's review of color and texture:
 - a. Concrete: Provide two (2) 4" square samples for each color and finish.
 - b. Concrete Masonry: Provide two (2) 4 by 8 inch samples of masonry, with mortar joint in the center, for each finish and color.
 - c. Painted Wood: Provide two (2) 12 inch square samples of each color and material on hardboard.
 - d. Ferrous Metal: Provide two (2) 4 inch square samples of flat metal and two (2) 8 inch long samples of solid metal for each color and finish.
 - e. Gypsum Board: Provide two (2) 12 inch square samples with texture selected by the Architect.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention not included in the Product Data.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum five years documented experience.
- C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.

- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F. and 90 deg. F.
- D. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F. and 95 deg. F.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F , unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 MOCK-UP

- A. Before proceeding with painting, finish one complete space or item of each color scheme required. This shall include selected colors, finished texture, materials, and workmanship. After approval, three (3) sample spaces or items shall serve as a quality control sample for similar work throughout the Project.

1.11 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide 1 gallon of each color and type to Owner.
- C. Label each container with color, type, and room locations in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Standard: For purposes of designating type and quality for the work of this section, Drawings and Specifications are based on products manufactured or furnished by **The Sherwin Williams Company** except as noted specifically otherwise.
- B. Manufacturers: Products of the following manufacturers having equal quality to those specified herein will be acceptable.

Benjamin Moore.
PPG Industries

2.02 MATERIALS

- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
 - 1. **NOTE:** All coatings, except alkyd based systems, shall be 100% acrylic and shall be so indicated in the submittal Product Data.
- B. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- C. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- D. Colors: Provide color selections made by the Architect from the manufacturer's full range of colors and custom colors where required to match Architect's samples or paint colors from a manufacturer not selected to provide the products.
- E. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- F. Patching Materials: Latex filler.
- G. Fastener Head Cover Materials: Latex filler.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.
- B. Verify that substrate conditions are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
- D. Correct defects which affect work of this section.
- E. Seal with shellac and seal marks which may bleed through surface finishes.
- F. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

1. Provide texture selected by the Architect.
 2. Provide smooth surface (no texture).
- H. Cementitious Materials: Prepare concrete, concrete masonry block and cement plaster, etc. where applicable surfaces are to be painted. Remove efflorescence, chalk, dust, dirt, grease oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
1. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 3. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
- I. Wood: Clean surfaces of dirt, oil and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off between coats of paint.
1. Prime, stain or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 2. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 3. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
- J. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces with same primer as the shop coat.
- K. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
1. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
- L. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

- M. Existing Surfaces: Clean, scrape, sand, and strip existing surfaces to extent required to remove all loose paint and eliminate all ridges, etc., and expose smooth surfaces.
 - 1. For limited paint removal, use abrasive methods, including scraping and sanding. Use hand tools and avoid gouging substrates. Use mechanical abrasive methods such as orbital sanders and belt sanders only with approval in each case. Do not use rotary sanders, sandblasting, or water blasting.
 - 2. Existing glossy surfaces shall be roughened by sanding or other accepted method that will produce a surface tooth to properly receive new paint or finish.

3.03 APPLICATION

- A. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's printed instructions.
 - 1. On masonry surfaces, filler coat and other first coats shall be applied by brush with subsequent coats being applied by spray, brush, or roller. On all other surfaces, prime and finish coats may be applied by spray, brush, or roller.
- B. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- C. Do not apply finishes to surfaces that are not dry.
- D. Apply each coat to uniform finish.
- E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- F. Sand metal lightly between coats to achieve required finish.
- G. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- H. Allow applied coat to dry before next coat is applied.

3.04 WORKMANSHIP

- A. Coverage and hide shall be complete. When color, stain, dirt, or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance, thickness, and coverage, at no additional cost to the Owner.
- B. Give special attention to insure that edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of adjacent painted surfaces.
- C. Rate of application shall not exceed average rate of coverage recommended by manufacturer for the type of surface involved less ten (-10%) percent allowance for losses, unless manufacturer's printed recommended specifications state that the recommended rate included normal expected losses.

- D. Minimum dry film thickness per coat shall not be less than thickness recommended by the manufacturer.
- E. Surface shall be free of skips in any coat, voids, pinholes, etc.
- F. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- G. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non specular black paint.
- H. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
- I. Make edges of paint adjoining other materials or colors sharp and clean, and without overlapping
- J. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks; and free from variations in color, texture, and finish.
- K. Do not paint wall surface more than 1/4" below the top of resilient base to eliminate the potential of paint being incompatible with base adhesive.

3.05 CLEANING

- A. Clean work under provisions of 01700.
- B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.06 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

- A. Steel doors and frames, and fire extinguisher cabinets.

3.07 INTERIOR PAINT SCHEDULE

- A. Dryfall System for Overhead Items (Steel structure, MEP items, etc.):
 - 1. Primer: S-W Pro Industrial ProCryl Acrylic Metal Primer, B66 Series.
 - 2. One (1) Finish Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, Flat, B42-80 Series
- B. Plywood Panels - Painted Epoxy (Semi-gloss):
 - 1. One Coat S-W Premium Wall and Wood Primer, B28W8111
 - 2. Two coats: S-W Pro Industrial Waterbased Catalyzed Epoxy, B73-300 Gloss finish

C. Metals (Semi-gloss):

1. One coat Pro-Cryl Universal Metal Primer B66-310 Series
2. Two coats Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series, low odor and less than 50 g/L to meet all VOC requirements

D. Gypsum Board (Eg-Shel-low luster):

1. One coat ProMar 200 Low VOC Interior Latex Primer
2. Two coats ProMar 200 Low VOC Interior Latex Eg-Shell B20-600 Series

E. Gypsum Wallboard (Semi-Gloss):

1. One coat ProMar 200 Low VOC Interior Latex Primer
2. Two coats ProMar 200 Low VOC Interior Latex Semi-Gloss B31 Series

F. Concrete Masonry Units (Semi-Gloss, Filled):

1. One coat Loxon Block Surfacer A24W200
2. Two coats ProMar 200 Low VOC Interior Latex Semi-Gloss B31 Series

G. Concrete Masonry Units (Gloss, Filled): As follows in **Warehouse area**

1. One coat Loxon Block Surfacer A24W200
2. Two coats Pro Industrial Multi-Surface Acrylic, Gloss.

3.08 EXTERIOR PAINT SCHEDULE

A. Metal: Exterior metals shall be given:

1. One coat Pro-Cryl Universal Metal Primer B66-310 Series
2. Two coats: Pro Industrial Urethane Alkyd Enamel, B54-150 Series.

END OF SECTION

STAINLESS STEEL CORNER GUARDS**SECTION 10260****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. 1-1/2" x 1-1/2" x full height of the partition stainless steel corner guards at all outside corners of drywall partitions where indicated on the drawings

1.02 SUBMITTALS

- A. Samples: 12 inch long piece of corner guard.
- B. Manufacturer's Literature and Data: Show method of attachment and model number, size, etc.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.
- B. Store in dry and protected location.
- C. Do not open packages until contents are needed for installation, unless verification inspection is required.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide impact-resistant wall protection system products equal to products by Afco-USA (American Floor Products Co.), Inc., Arden Architectural Specialties, Inc., and Pawling Corporation.

2.02 MATERIALS

- A. Stainless-Steel Plate: Type 304, minimum 16 gauge thickness.
- B. Mounting Material: Contact cement of type recommended by the manufacturer for use with material on the substrate indicated.

2.03 CORNER GUARDS

- A. Stainless-Steel Corner Guards: Paper-covered, satin-finish, 16 gauge, stainless-steel sheet corner guards; height as indicated and if not indicated, provide 4 foot height. Provide 90-degree and 135-degree turn as required, unless otherwise indicated; and formed edges.
 - 1. Wing Size: 1-1/2" x 1-1/2"
 - 2. Corner Radius: 1/8 inch (3.2 mm).
 - 3. Finish: No.4, directional polish, run grain with long dimension.

2.04 FABRICATION

- A. General: Fabricate impact-resistant wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including thicknesses of components.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of roll marks, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with the written recommendations of the manufacturer for secure, level, plumb and proper installation. Install the work in locations indicated on the Drawings, with proper anchorage.
- B. Remove excess adhesive as recommended by manufacturer.

END OF SECTION

INTERIOR SIGNAGE**SECTION 10400****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Raised panel (ADA compliant) signs for toilet rooms, stair, exits, all rooms, etc. with extent and text/numbers contained in schedule herein.
- B. Attachment devices and accessories as required for a complete installation including factory mounted double-sided foam tape and field applied adhesive. Contractor shall verify the particular substrates for compatibility.
- C. Exterior signage is provided by the Owner and is NIC.

1.02 REFERENCES

- A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- B. ANSI A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's literature for standard components.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcements, accessories, layout, and installation details.
- D. Shop Drawings: Show each sign type, style, colors and method of attachment. For each sign, show type, lettering, location, and dimensions.
 - 1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections
- E. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Initial Selection: Manufacturer's color charts consisting of actual selections of material including the full range of colors available for each material required.
 - 2. Samples: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material indicated. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic

devices.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements for assuring access for persons with disabilities in accordance with federal and local regulations, including:
 - 1. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
 - 2. ANSI A117.1.
- B. Single Source Responsibility: For each separate type of sign required from a single manufacturer.
 - 1. Specifications are based on ASI.
- C. The specifications are basic minimum requirements and if more stringent requirements are needed to comply with ADA, those must be provided.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs separately or in like groups of names, labeled as to names enclosed. Include installation template, attachment system, and installation instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install signs until ambient temperature has reached that recommended by sign manufacturer and will be maintained at that temperature during and after installation of signs.

PART 2 - PRODUCTS

2.01 INTERIOR SIGN TYPES

- A. Tactile Letters, Symbols, and Pictograms (ADA Compliant Provisions); based on Interior Unframed Signs – Photopolymer Bonded To Acrylic; Intouch™ by ASI
 - 1. Material: Photo polymer with a minimum durometer reading of 70 percent in a Shore D configuration, 1/8 inch thick.
 - 2. Raised Letters: Laser or machine-cut precise characters with square cut edges free from irregularities raising 1/32 inch and accompany with corresponding Grade II braille.
 - 3. Apply graphic color to the raised characters using a hot stamp process.
 - 4. Apply a clear protective coating.
 - 5. Comply with ADAAG Section 4.30.4 for raised characters, symbols, and pictograms.
 - 6. Provide font and contrasting colors selected by the architect.
- A. Braille: Computer-generated precision embossed Grade 2 Braille conforming to ADAAG Section 4.30.4.
- B. Flush Mounting Method: Factory mounted double-sided foam tape, with permanent adhesive silicone adhesive for field application as recommended by sign manufacturer for applicable substrates.

- C. Accessories: Manufacturer's standard accessories for types of signs required.
- D. Sizes of letters and numbers shall be as follows, unless otherwise indicated on the Drawings.
 - 1. Lettering for restroom identification shall be 1" high, corresponding symbols shall be 3" high.
- E. Letters and numbers shall be centered on sign.
- F. Grade 2 braille shall be placed directly below last line of letters or numbers.
- G. Sign Size: As follows unless otherwise indicated on the Drawings:
 - 1. Restroom signs shall be 6" x 8".
 - 2. Radius corners: 1/2".
 - 3. Character Proportion: Letters and numerals on sign shall have a width to height ratio in which the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I", and a stroke thickness of the uppercase "I" must be 10 percent minimum and 30 percent maximum of the height of the character.
 - 4. Character Height: Characters and numbers on signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case X and in no case less than 2". Lower case characters are permitted.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions are acceptable and substrates are ready to receive signs.

3.02 PREPARATION

- A. Protect adjacent areas during sign installation; take special precautions as necessary to prevent adhesives from coming into contact with finished surfaces.
- B. Surface Preparation: Clean surfaces and prepare as recommended by sign manufacturer for proper attachment of signs.

3.03 INSTALLATION

- A. Install signs in accordance with manufacturer's recommendations and installation instructions. Install level, plumb, true to line, and with sign surfaces free from distortions and defects.
 - 1. At interior signs, use factory double-sided tape in addition to field applied adhesive.
- B. Install signs after surfaces to which they are to be mounted have been completely finished.
- C. Install in locations indicated on drawings and in conformance to applicable regulatory requirements.
 - 1. Mount at 60 inches above finish floor in location where a person can approach within 3

inches of sign without entering a door swing area. Generally, signs shall be installed on the wall adjacent to the latch side of the door and 12" from the door frame. If there is no space on the latch side of the door, including double leaf doors, signs shall be placed on the nearest adjacent wall.

2. Stairway Signs: Mount approximately 60 inches above floor immediately adjacent to door on strike side, readily visible when door is open.
3. Toilet Room Signs: Mount symbols centered on door unless otherwise indicated on the Drawings. Mount room number/name signs in same manner as ADA tactile signs

D. Set in predrilled holes filled with quick-setting cement.

3.04 CLEANING AND PROTECTION

- A. Clean sign surfaces in accordance with manufacturer recommendations.
- B. Protect signs from damage until substantial completion.

3.05 INTERIOR SIGN SCHEDULE

- A. Signs shall comply with the visual character and physical tactile requirements of ICC/ANSI A117.1 American National Standard for Accessible and Usable Buildings and Facilities.
 1. Provide adjacent to each door to an egress stairway a tactile sign with text "EXIT" complying with A117.1.
 2. Provide adjacent to each door at the entrance of each toilet room a sign with pictogram and "MEN" and "WOMEN" text description including braille corresponding for each gender complying with A117.1.
 3. Provide adjacent to each elevator call station text descriptor, including braille complying with A117.1. Text shall be "IN FIRE EMERGENCY, DO NOT USE ELEVATOR. USE EXIT STAIRS".
 4. Provide identification sign at outside of each stair, each floor, with text "Stair No. 1", etc.
 5. Provide two signs at interior of each stair, each floor with text: "Floor x and "Stair No. X
Floor X Exit to Floor 1 to (Arrow)" X Floor"
 6. Room identification signs at all rooms WITH NAMES ON THE DRAWINGS.
 7. Provide at each exit door to the outside a low level tactile sign with text "EXIT" complying with A117.1

END OF SECTION

LOCKERS**SECTION 10500****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Metal wardrobe lockers of type and extent indicated on the drawings
 - 1. Single-tier lockers
 - 2. Triple-tier lockers
- B. Bases, trim, and filler panels.
- C. Accessories and hardware.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers and benches.
- C. Shop Drawings: Layout and dimensions of lockers. Indicate relationship of adjoining surfaces. Show locker elevations and details, fillers, trim, base, tops, and accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.
- D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- E. Samples for Color Verification: Samples showing actual colors prepared on same material to be used for the work.
- F. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing and replacing locker doors and latching mechanisms.

1.03 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Protect locker finish and adjacent surfaces from damage.
- C. Deliver master keys, control keys, and combination control charts to Owner.

1.05 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Metal Locker Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. All American Locker Div.; De Bourgh Mfg. Co.
 - 2. Art Metal Products Co.
 - 3. Interior Steel Equipment Co.
 - 4. Lyon Metal Products.
 - 5. Medart, Inc.
 - 6. Penco Products, Inc.
 - 7. Republic Storage Systems.

2.02 METAL WARDROBE LOCKER MATERIALS

- A. Steel Sheet: ASTM A 366 (A 366M), commercial-quality, stretcher-leveled, cold-rolled carbon steel sheet, stretcher leveled, free of buckling, scale, and surface imperfections.
- B. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, with Class C zinc coating, mill phosphatized.
- C. Fasteners: Cadmium, zinc, or nickel plated steel; exposed bolt heads, slotless type; self-locking nuts or locker washers for nuts on moving parts.
- D. Equipment: Hooks of cadmium-plated or zinc-plated steel or cast aluminum.

2.03 METAL WARDROBE LOCKERS

- A. General: Specifications are based on "Scholastic Quiet Lockers" by Lyon Metal Products, Inc.
- B. Construction: Fabricate lockers square, rigid and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections as standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames.
- C. Frames: Fabricate of 16 gage channels or 12 gage angles, minimum, with continuous stop/strike formed on vertical members.
 - 1. Extend vertical members to floor to form legs where shown.
 - 2. Provide minimum 16 gage horizontal members between doors of double-tier lockers, or other method, to ensure rigidity.
- D. Body: Fabricate back and sides of minimum 24 gage steel, with double-flanged connections extending full height for recess application.
- E. Tops, Bottoms and Shelves: Minimum 24 gage steel, flanged edges.

- F. Door: One-piece, minimum 16 gage sheet steel, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees.
 - 1. Provide extra bracing or reinforcing on inside of doors over 15" wide.
- G. Provide stamped louvered vents in door faces, as follows:
 - 1. For single-tier lockers, not less than 6 louver openings top and bottom.
- H. Hinges: Heavy-duty, not less than 0.050" thick steel, full-loop, 5-knuckle, tight pin, 2" high. Weld to inside of factory-installed fasteners which are completely concealed and tamperproof when door is closed. Provide at least 2 hinges for each door 42" high or less.
- I. Recessed Handle and Latch: Manufacturer's standard design consisting of housing to form recess for latch lifter and locking devices with nylon glide plugs positioned to eliminate any metal-to-metal contact; non-protruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch mechanism with latching action as follows:
 - 1. Single-tier lockers: Three point latching at single -tier units and two point latching at triple -tier units.
- J. Acoustical Treatment: Provide construction treatment designed to significantly reduce noise of locker operation, including protected sound-absorbing material within door, nylon or plastic coatings on operating components to prevent metal-to-metal contact, and latching mechanism designed to operate without rattling.

2.04 LOCKER ACCESSORIES

- A. Locking: Fabricate lockers to receive the following locking devices:
 - 1. Padlock: Fabricated to receive padlock with padlock being provided by Owner.
- B. Number Plates: Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals not less than 3/8" high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, centered, with at least two (2) fasteners of same finish as number plate.
- C. Continuous Metal Base: Minimum 20 gage cold-rolled steel, fabricated in lengths as long as practicable to enclose base of lockers without additional fastening devices. Flange bottoms inward 3/4" for stiffening. Factory-finish metal base to match lockers.
- D. Sloping Tops: Not less than 20 gage sheet steel, approximately 25 degrees pitch, in as long lengths as practicable. Provide closures at ends. Finish to match lockers. Provide at lockers that are not recessed.
- E. Separators: Provide horizontal dividers of not less than 16 gage sheet steel between doors of multiple-tier lockers, to ensure rigidity.
- F. Trim: Provide trim at jambs and head of recessed lockers, consisting of not less than 18 gage cold-rolled steel, 2" or 3" wide as necessary. Factory-finish trim to match lockers. Secure trim to lockers with concealed fastening clips.

- G. Filler Panels: Provide filler panels where indicated, of not less than 16 gage steel sheet, factory-fabricated and finished to match locker units.
- H. Equipment: Provide each locker with the following accessories, unless otherwise shown:
 - 1. Single-Tier Units: One double-prong ceiling hook, 3 single-prong wall hooks, one shelf.
 - 2. Triple-Tier Units: One double-prong ceiling hook
 - 3. Lockers 18" Deep: Provide a hang rod in lieu of ceiling hook.

2.05 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces complying with SSPC-SP 1 to remove dirt, oil grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling), and phosphatize surfaces.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices minimum 48" o.c. to suit substrate materials with minimum pullout force of 100 lbs.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, trim, and bases as shown.
- G. Install accessories.

3.03 ADJUSTING AND CLEANING

- A. Clean work under provisions of 01700.
- B. Clean locker interiors and exterior surfaces.
- C. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.
- D. Touch-up marred finishes, but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES**SECTION 10522****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers with cabinets. In fire rated walls, provide fire rated cabinets. Cabinet shall be tested and approved by Warnock Hersey to ASTM E-814, and shall bear the Warnock Hersey label where located in fire rated wall construction.
- B. Semi- recessed stainless steel cabinets, solid door with vertical safety glass section and graphics applied, except and wall bracket mounted 5 lb. capacity Halon unit at the new IT room **at location directed by the Architect..**
- C. Accessories.
- D. Provide initial inspection tag for each extinguisher with date not being earlier than the date of substantial completion

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Systems: Roughed-in wall openings.

1.03 REFERENCES

- A. ANSI/NFPA 10 - Portable Fire Extinguishers.
- B. ANSI/UL 92 - Fire Extinguisher and Booster Hose.
- C. ANSI/UL 711 - Rating and Fire Testing of Fire Extinguishers.
- D. UL 299 - Dry Chemical Fire Extinguishers.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements and location.
- C. Product Data: Provide extinguisher operational features, color and finish and anchorage details.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 QUALITY ASSURANCE

- A. Provide units conforming with ANSI/UL 711 or ANSI/UL 92

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for requirements for extinguishers.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 0-2409-5R Architectural Series by Larsen's Manufacturing Co., semi-recessed with 2-1/2" square edge trim

2.02 EXTINGUISHERS

- A. Multi-Purpose Dry Chemical Type: UL 299, Cast steel tank, with pressure gage; U.L. rating 21-20B:C, 10 lb. capacity for Class A, B and C fires. These units shall contain specially fluidized and siliconized mono ammonium phosphate powder which smothers and breaks the chain reaction on Class B fires, fuses and insulates Class A fires, and as a non-conductor of electricity, is effective on Class C fires.
- B. Halon System: Halotron I EPA approved clean agent which discharges as a rapidly evaporating liquid, leaving no residue, effectively extinguishing Class A, B and C fires equal to Halotron I by Larsens

2.03 CABINETS

- A. Metals: 18 gage min. Type 304 stainless steel door and frame.
- B. Configuration: 24 inches x 9-1/2 inches x 6 inches inside tub dimension. Cabinet box semi-recessed in walls with 2-1/2" square edge trim with hinges for 180° opening.
- C. Door: 18 gage thick Type 304 stainless steel, reinforced for flatness and rigidity, 3/4" thick, solid face.
- D. Bracket: Hook type; Larsen's #1007, or equal.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Prefinished steel, white enamel finish.
- B. Cabinet Signage: Die-cut letters

2.05 FABRICATION

- A. Form cabinet enclosure with right angle inside corners and seams with square edges for semi-recessed mounting, reinforced for flatness and rigidity.
 - 1. Tub Construction: 22 gauge min. Type 304 stainless steel steel
- B. Exposed Trim: One-piece combination Type 304 stainless steel steel trim and perimeter door frame overlapping surrounding wall surface with exposed trim and wall return at outer edge (backbend); trim of 2-1/2 inch backbend depth.
- C. Hardware: Continuous concealed piano hinge constructed of material which matches door and trim material. Satin finish pull handle with cam cylinder lock with safety pull designed to release upon firm pull on handle (Larsen's "Larsen-Loc"™, J.L. Industries "Saf-T-Lok"™; or equivalent).
- C. Weld, fill, and grind exposed components smooth.
- D. Pre-drill for anchors.

2.06 FINISHES

- A. Extinguisher: Steel, enamel to red color.
- B. Cabinet Exterior Trim and Door: Stainless steel.
- C. Cabinet Interior: Stainless steel.
- D. Lettering: Die cut lettering "Fire Extinguisher", red color, for vertical application

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions. Each cabinet shall have a fire extinguisher as specified.
 - 1. Location: As indicated on the Drawings and if not indicated, provide units and install at location directed by the Architect as required by NFPA 10.
- B. Install cabinets plumb and level in wall openings.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.
- E. Mounting: Provide eye brackets for direct wall mounting to hook and for mounting in Fire Extinguisher cabinets. Refer to drawings for location and quantity

END OF SECTION

TOILET ACCESSORIES**SECTION 10800****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Toilet accessories.
- B. Attachment hardware.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 06100 - Carpentry or 09260 Gypsum Board Systems: Installation of concealed anchor devices and backing plate reinforcement.

1.03 RELATED SECTIONS

- A. Section 09260 Gypsum Board Systems: In wall framing and plates for support of accessories.
- B. Section 08800 - Glazing: Frameless wall mirrors.

1.04 REFERENCES

- A. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- B. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.
- C. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.
- D. ANSI/ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
- E. ANSI/ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- F. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- G. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.05 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Provide product data on accessories describing size, finish, details of function, attachment methods. Include schedule showing proposed model numbers and mounting heights.

1.06 KEYING

- A. Supply two keys for each accessory to Owner.
- B. Master key all accessories.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for installing work in conformance with ANSI A117.1.
- B. Comply with requirements of the American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).

1.08 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Drawings and Specifications are based on products manufactured as indicated on the drawings to establish standards of quality and design. The following manufacturers are acceptable to provide products equal to those specified:
 - 1. Bradley Corporation
 - 2. The Charles Parker Company
 - 3. American Specialties, Inc.
 - 4. American Dispenser Company
 - 5. Bobrick Washroom Equipment, Inc

2.02 MATERIALS

- A. Sheet Steel: ANSI/ASTM A366.
- B. Stainless Steel Sheet: ASTM A167, Type 304.
- C. Tubing: ASTM A269, stainless steel.
- D. Fasteners, Screws, and Bolts: Hot dip galvanized.
- E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FABRICATION

- A. Weld and grind smooth joints of fabricated components.

- B. Form exposed surfaces from single sheet of stock, free of joints.
- C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.
- E. Shop assemble components and package complete with anchors and fittings.
- F. Provide stainless steel anchor plates, adapters, and anchor components for installation.
- G. Hot dip galvanize exposed, painted ferrous metal and fastening devices.
- H. Comply with fabrication standards indicated by the established quality standard with attention brought to the following requirements:
 - 1. Grab Bars: Minimum 13 gauge stainless steel tenon plates, bar return of 90 degrees, shot and concealed mounting to withstand loads specified herein and required by ADA.
 - a. Provide 16 gauge stainless steel back plate anchor at toilet partitions.
 - 2. Pulls: Stainless steel pulls; applied plastic pulls are not acceptable.
 - 3. Waste Receptacles: Removable from frame and all edges hemmed, full backs of stainless steel.
 - 4. Towel Dispensers: All exposed edges hemmed, full backs of stainless steel.
 - 5. Trim Flanges: One-piece seamless construction without mitered corners.
 - 6. Hinges: Stainless steel full length piano hinges at all doors and lids.

2.04 GRAB BARS PERFORMANCE REQUIREMENTS

- A. Size and Spacing of Grab Bars: The diameter or width of the gripping surfaces of a grab bar shall be 1-1/4 inch to 1-1/2 inch or the shape shall provide an equivalent gripping surface. If grab bars are mounted adjacent to a wall, the space between the wall and the grab bar shall be 1-1/2 inch.
- B. Structural Strength: The structural strength of grab bars, fasteners, and mounting devices shall meet the following specifications:
 - 1. Bending stress in a grab bar induced by the maximum bending moment from the application of 250 lbf shall be less than the allowable stress for the material of the grab bar.
 - 2. Shear stress induced in a grab bar by the application of 250 lbf shall be less than the allowable shear stress for the material of the grab bar. If the connection between the grab bar and its mounting bracket or other support is considered to be fully restrained, then direct and torsional shear stresses shall be totaled for the combined shear stress, which shall not exceed the allowable shear stress.
 - 3. Shear force induced in a fastener or mounting device from the application of 250 lbf shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.
 - 4. Tensile force induced in a fastener by a direct tension force of 250 lbf plus the maximum moment from the application of 250 lbf shall be less than the allowable withdrawal load between the fastener and the supporting structure.
 - 5. Grab bars shall not rotate within their fittings.

2.05 FACTORY FINISHING

- A. Galvanizing: ANSI/ASTM A123 to 1.25 oz/sq yd.
- B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats electrostatic baked enamel.
- D. Chrome/Nickel Plating: ANSI/ASTM B456, Type SC 2 satin finish.
- E. Stainless Steel: No. 4 satin luster finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings or as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.

3.03 INSTALLATION

- A. Install fixtures, accessories and items in accordance with manufacturers' printed instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate with concealed fastening system.
- C. Install concealed mounting devices and fasteners fabricated of the same material as the accessories.
- D. Install exposed mounting devices and fasteners finished to match the accessories.
- E. Provide theft-resistant fasteners for all accessory mountings.
- F. Secure toilet room accessories in accordance with the manufacturer's instructions for each item and each type of substrate construction.
 - 1. Where no mounting height is indicated on the Drawings, install accessories at heights recommended by the manufacturers to comply with ADA requirements which shall be verified with the Architect.

3.04 CLEANING

- A. Remove soil, stain, and extraneous materials caused by accessory installation.
- B. Remove and replace items and materials that cannot be satisfactorily cleaned.

3.05 SCHEDULE

- A. Refer to Schedule on Drawings.

END OF SECTION

VLM UNITS**SECTION 11100****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. VLM lift units with 30 trays and dividers, utility connections and all accessories required for fully operation unit.
- B. See Section 01030-Alternates

1.02 RELATED SECTIONS

- A. Division 16 – Utilities for the units.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Submit shop drawings for fabrication and erection. Include plans, elevations, and large scale details. Show anchorages, diagrams, templates and accessory items,
- C. Product Data: Submit manufacturer's technical data and installation instructions for each type of specialty required.
- D. Samples: Submit two (2) samples of exposed materials and accessories required.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.

1.05 FIELD MEASUREMENTS AND COORDINATION

- A. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of the work. Coordinate items to be built-in other work specified in other Sections

1.06 WARRANTY

- A. Two (2) year manufacturer's warranty against defects in materials and workmanship and service including 3 PM's.

PART 2 - PRODUCTS

2.01 VLM UNITS

- A. Manufacturers: As follows:
 - 1. Modula – MX50D
 - 2. White - Compact Twin 350 3660 H start-6026
 - 3. Kardex - XP500
- B. Unit specifications as follows:
 - 1. Height: 22'1.75"
 - 2. Unit Dimensions: 156.69" (W) x 120.98" (D)
 - 3. Trays per VLM: 30 trays Capacity
 - 4. Tray Dimensions: 143.7 inches (W) x 34 inches (D)
 - 5. Trays included: 30
 - 6. Tray Weight Capacity: Minimum 900 lbs. per tray
 - 7. Average Tray Spacing: 12.80 inches
 - 8. Features: Light Curtin, dividers

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examination of substrates: The Installer must examine the substrate and the conditions under which the work is to be performed, 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. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions for the particular conditions of installation in each case.
 - 1. Location: As indicated on the Drawings.
- B. Install level, plumb, and at proper height. Connect all required utilities. Repair or replace damaged units as directed by Architect.
- C. Secure rigidly in place.

END OF SECTION

KITCHEN APPLIANCES**SECTION 11450****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Provide appliances as indicated on the drawings; Refrigerator/Freezer, dishwasher, and washer and dryer, stainless steel finish

1.02 QUALITY ASSURANCE

- A. Provide equipment complete with all required components, services and accessories, bearing UL labels for electrical units.
- B. Standard of Quality: Certain items of equipment are indicated in this section according to brand names, model numbers or catalog designations of proprietary manufacturer. Their designations are employed herein to establish design, function and quality only and are not intended to restrict competitive bidding.

1.03 SUBMITTALS

- A. Product Data: Submit two (2) copies of manufacturer's specifications and installation instructions for each type of equipment and method installation required.
- B. Samples: Submit two (2) samples of metal finishes and colors.

PART 2 - PRODUCTS**2.01 APPLIANCES**

- A. As follows
 - 1. Refrigerator - GE 24.7 Cu. Ft. Stainless Steel French Door Refrigerator Model #GNE25JYKFS
 - 2 - Dishwasher - GE Stainless Steel Interior Dishwasher with Hidden controls Model #GDT226S
 - 3 - Washer - GE Profile Top Loading 5.4 cu. ft. Capacity Washer White Model #PTW700BSTWS
 - 5 - Dryer - GE Profile Front Loading 7.4 cu. ft. Capacity Dryer White Model #PTD70EBSTWS

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Provide templates and rough-in measurements as required.
- B. Verify exact location of accessories for installation.

3.02 INSTALLATION

- A. Install appliances in accordance with manufacturer's printed instructions, plumb and level, securely and rigidly anchored to substrate.
- B. Ensure that operating parts work freely and fit neatly. Adjust hardware and catches as required.
- C. Repair or replace damaged parts, dents, buckles, abrasion or other damage affecting appearance or serviceability, as acceptable by the Architect.
- D. Coordinate and cooperate with other trades for proper location of roughing-in services and connections specified in Divisions 15 and 16 of these specifications.

END OF SECTION

ELECTRIC ELEVATORS

SECTION 142150

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Machine room less traction elevator systems, front opening 3500 lb. passenger elevator., Class “A” Passenger unit, complete for specified operations.. Emergency recall shall bring cab to the ground floor level.
- B. Cabs with doors and frames for **front and rear loading**; hoistway entrance doors and frames;; traction machine, controllers, hoistway equipment, fixtures and all accessories for a complete installation. **Provide one (1) operating panels on either side of each cab entrance.**
- C. Firefighters' Emergency Recall: An emergency return system shall be provided in full compliance with the latest state, local and ASME Code requirements. Heat, smoke and products of combustion sensing devices (sensors) and sensor wiring to the elevator controller shall be provided in Division 16.
- D. Battery back-up system for operating the elevator to take the car to the first floor and doors open when a power outage occurs.
- E. Voice annunciation systems utilizing prerecorded human voice messages played through speakers in the elevator cab. These announcements shall provide floor information, direction of travel (up/down), and special announcements or warnings as selected by the Owner
- F. Attention is called to overhead clearances, pit clearances, hoistway dimensions, overall space in controller rooms and construction conditions. Addition or revision of space requirements or construction changes that may be required for complete installation of the proposed elevators must be arranged for and obtained by Elevator Contractor through the Architect. Cost of such changes shall be included in the contract sum. Clearance around elevators, mechanical equipment, and electrical equipment shall comply with applicable provisions of NEC and other codes. Arrange equipment so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment.
- G. Clearance around elevators, mechanical equipment, and electrical equipment shall comply with applicable provisions of NEC and other codes. Arrange equipment so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment.
- H. Any changes to equipment, locations, dimensions, finishes, utilities, etc. from the construction documents and reviewed submittals must be done only with the written approval of the Architect.
- I. Verify that sufficient and correct type electrical service is available and provided to the correct locations for fully operational elevator systems
- J. Contractor shall provide:
 - 1. Rail bracket supports, bracket spacing as required by governing code. Separator beams

- where required.
 - 2. Vertical iron ladder extending 42" minimum above sill of access door in the elevator pits.
 - 3. Sill angle support. Sill supports to be plumb and square with the hoistway.
 - 4. Hoistway walls are to be constructed to meet (2) hour UL label fire rating including where penetrated by elevator fixture boxes. One front entrance wall, at the main landing, is not to be constructed until after all elevator material is located in the hoistway. Remaining front entrance walls are not to be constructed until after door frames and sills are in place.
 - 5. Hoisting beam for a maximum net live load of 7,500 lbs.
 - 6. All cutting, including cutouts to accommodate hall signal fixtures, patching, and painting of walls, floors, or partitions together with finish painting of entrance doors, car doors and frames shall be provided by the General Contractor.
 - 7. Clear, plumb hoistway, with variations not to exceed 1" at any point in the first 100ft. Tolerance may increase at 1/32" for each additional 10ft up to a maximum of 2". Minimum two hours of fire resistance rating of hoistway walls
 - 8. **Note:** All miscellaneous steel not shown on the drawings is the responsibility of the elevator manufacturer to furnish and install required steel
- K. The Contractor is responsible to assure his equipment will operate satisfactorily within the specified conditions, hoistway sizes, overrun space and equipment spaces. If modifications are required, it shall be the Contractor's responsibility to make any necessary changes as needed.
- 1. Should any equipment be furnished that will not properly function within the specified parameters, it shall be the Contractor's responsibility to pay any additional costs attributable to providing the correct equipment.
- L. The elevator vendor must provide a priced spare parts list with prices good for at least three (3) years and indicate availability of spare parts. Also provide a "Full Maintenance" proposal for one (1) year beyond the specified maintenance requirements for the first year after final acceptance testing, including cost, services, terms and conditions on vendor letterhead.
- M. If proprietary diagnostic equipment or special tools are required for elevator maintenance, the diagnostic equipment must be supplied with the elevator and not password or date protected.
- N. Elevator Contractor must include cost and description of training available for Owners maintenance personnel.
- O. **Note:** All miscellaneous steel not shown on the drawings is the responsibility of the elevator manufacturer to furnish and install required steel.
- P. Temporary Elevator Use: If temporary use is required and approved in writing by the Owner, enclose elevator as follows:
- 1. Enclose cab with protective plywood on floor, walls, and ceiling.
 - 2. Provide temporary lighting.
 - 3. Provide control panel with manual and emergency operation

1.02 RELATED SECTIONS

- A. Section 01500 - Construction Facilities and Temporary Controls: Temporary power supply.

- B. Division 3 - Concrete Work: Concrete for elevator pit and grouting of thresholds.
- C. Section 05500 - Metal Fabrications: Pit ladder and sill supports.
- D Division 9 - Floor finishes in cabs.
- E. Division 15- Mechanical: Ventilation and heating of machine room and machinery space with Provide air conditioning in machine room as required to maintain temperature as required by equipment manufacturer and the governing authority. This work includes hoistway ventilation to the outside with the installation of duct, wall louvers, moldings, flanges, strap anchors, screens, frames, grilles and vent covers as necessary.
- F. Division 16 - Electrical:
 - 4. Empty conduit to elevator equipment devices remote from elevator machine room or hoistway.
 - 5. Electrical wiring connections.
 - 6. Electrical service to main disconnect in elevator machine room including electrical power for elevator installation and testing.
 - 7. Electrical service for machine room, machine room convenience outlets, and pit. Electrical service to each elevator and elevator controller including new fused disconnect switches with a shunt trip which shall remove power to the disconnects before water is applied by the sprinkler system in the hoistway overhead and machine room areas.
 - 8. Lighting and outlet in elevator pit with switch located adjacent to access door or ladder. Provide adequate lighting with new fluorescent light fixtures and suitable convenience outlets in the machine room and light switches located within 18" of lock jamb side of the machine room door
 - 9. Empty conduit for telephone service to machine room.
 - 10. Fire Alarm and Smoke Detection Systems: Fire and smoke detectors and interconnecting devices. Heat, smoke or products of combustion sensing devices connected to elevator machine room or control room terminals when such devices are required. Make contacts on the sensors should be sided for 120 volt D.C.
 - 11. Fire alarm signal lines to elevator controller cabinet.
 - 12. A fused disconnect switch for each elevator and light switch located per the National Electrical Code (NFPA No. 70), and where practical, located inside the machine room or control room adjacent to the door.
 - 13. Feeder and branch wiring circuits to the controller, including main line switch and convenience outlets.
 - 14. Provide a telephone circuit terminated at each controller. Elevator contractor shall supply and wire telephone cable between controller and car. When separate firefighters' telephones are required, provide as above.
 - 15. Provide a 20A, 120 volt, single-phase protected branch circuit from a normal/emergency power source to the elevator group supervisory panel. provide a separate, 120 volt A.C., 20 amp, single phase power supply with SPST fused disconnect switch and feeder wiring to each controller of the group for the elevator signal system. Disconnect switch(es) are to be located in the elevator machine room and installed in accordance with NFPA 70 NEC. General Contractor shall provide a 120 volt, A.C., 15 amp, single phase power supply with fused SPST disconnect switch for each elevator, with feeder wiring to each controller for car lights.

16. Provide circuits to each controller for life safety speakers and firefighters' phone communication, if required. Furnish car speaker and phone jack for mounting and wiring by elevator contractor. Furnish and install firefighters' phone jacks in a separate fixture at each elevator lobby.
14. Provide an isolation transformer sized to suit the elevator power characteristics for each elevator. System shall contain necessary isolation transformer to completely isolate the system from building power thereby eliminating any line pollution from the building power supply and as required by the equipment manufacturer.
15. Provide all conduit, fittings, grounding and wiring for electrical service which shall meet or exceed the requirements of ASME A17.1 and NFPA 70 NEC. The new disconnects shall have a contact to remove emergency power when the main line disconnect is in the off position. Size to suit Elevator Contractor.
16. Suitable copper feeder, ground and branch wiring circuits for signal system and power operated door, included main line switch. Feeder and branch wiring circuits for car light and fan, including main line switch.
17. Fire fighter's telephone jacks as required by elevator contractor.

1.03 REFERENCES

- A. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
- C. ADA - American with Disabilities Act of 1990, Title III (Accessibility Regulations for Private Entities) and latest amendments (if any).
- D. ANSI/ASME A17.1 – 2000 with latest addenda - Safety Code for Elevators and Escalators.
- E. ANSI/ASME A17.2 - Inspector's Manual For Elevators and Escalators.
- F. ASTM A36 - Structural Steel.
- G. ASTM A366 - Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
- H. ANSI/AWS D1.1 - Structural Welding Code, Steel.
- I. ANSI/NFPA 70 - National Electrical Code.
- J. ANSI/NFPA 80 - Fire Doors and Windows.
- K. ANSI/UL 10B - Fire Tests of Door Assemblies.
- L. APA - American Plywood Association.
- M. ASTM A139 - Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4- in. and Over).
- N. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- O. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural

(Physical) Quality.

- P. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
- Q. NEMA LD3 - High Pressure Decorative Laminates.
- R. NEMA MG1 - Motors and Generators
- S. Steel Structures Painting Council (SSPC) - Steel Structures Painting Manual.

1.04 SYSTEM DESCRIPTION

A. **Elevator:** Performance/Characteristics of elevator are as follows:

1. Type: Gearless traction, machine room-less.
2. Quantity of Elevators: see drawings
3. Number of Stops: See drawings
4. Number of Openings: See drawings.
5. Rise: See drawings
6. Roping: 2:1
7. Rated Load: 3500 lbs
8. Rated Speed: 350 feet per minute
9. Car Dimensions (platform): 6'- 8" Wide x 5'-5" Deep
10. Note: height under ceiling: 8'- 8", unless otherwise indicated on the drawings
11. Entrance Dimensions: 3'- 6 x 8'- 0"
12. Entrance Type: Sliding side door opening, front and rear
13. Stopping Accuracy: $\pm 1/4$ " (6.4 mm) under any loading condition or direction of travel.
14. Main Power Supply: See drawings.
15. Lighting Power Supply: 120 Volts, 1 Phase, 15 Amp, 60 Hz.
16. Car Operating Panel: Two (2) panels, one at front opening and one at rear opening
17. Signals: Impulse signal fixtures. Car buttons mounted at 20° angle. Position indicator in car. Illuminated car and hall registration pushbuttons.
18. Operation: Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons

B. Operating Features:

1. Full Collective Operation
2. Anti-nuisance
3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Single Speed Fan
6. On/Off Light Switch
7. Solid State Starting
8. Remote elevator monitoring REM® ready
9. Fireman's Emergency Service Phase I and Phase II per ANSI A17.1 with integrated signage
9. Top of Car Inspection
10. Car-stall protection

C. Additional Features:

- 1.Braille and Audible Signals
- 2.Dispatch Protection
- 3.Door Nudging
- 4.Emergency Lighting
- 5.Failed Car
- 6.False Car Canceling
- 8.Independent Service Feature
- 9.Infrared Light Curtain Door Protection
- 10.Inspection Service
- 11.Load Weigh Bypass
- 12.Locking Service Panel in Car Operating Panel
- 14.Telephone (ADA compliant)Anti-nuisance
15. Solid State Starting
16. Emergency return unit (automatic return to the ground floor).
17. Electric brake option to eliminate access panels in shafts
18. Access at bottom landing with zoning
19. Access at top landing with zoning
20. Provide two-way communication between the elevator landing(s) and a central point (located in coordination with the local fire department). The two-way communication system shall:
 - a) include directions for the use of the two-way communication system
 - b) instructions for summoning assistance via the two-way communication system
 - c) written identification of the location shall be posted adjacent to the two-way communication system.
 - d) be in accordance with ADA-ABA 207 and 216.

D. Door Control Features:

1. A direct current motor driven heavy duty operator shall be provided, designed to operate the car and hoistway doors simultaneously. Controls shall be a closed loop, microprocessor based door operator system. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure,. The leading edge of the car door shall be provided with a retractable reversal edge arranged to automatically return can and hoistway doors to the open position in the event doors are obstructed during closing cycle. Doors shall then resume closing cycle.
2. Doors shall automatically open when the car arrives at the landing and shall automatically close after an adjustable time interval or when the car is dispatched to another landing. Direct drive geared operators, AC controlled units with oil checks, or other deviations from the above are not acceptable. Door noise not to exceed 58dBA.
3. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches (33 mm) in diameter when inserted between the car doors at vertical positions from within 1 inch (25 mm) above the sill to 71 inches (1800 mm) above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4"

(100 mm) in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4" object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.

4. The door reopening device shall also include a secondary, three dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door opening device shall cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.
5. The size of the secondary protection zone shall vary as the door positions vary during opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately centered in the door separation. In order to minimize detection of hallway passers-by that are not entering the elevator, the maximum zone penetration into the entryway shall not exceed 20" for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14" for a door separation of 42". The penetration shall reduce proportionally as the doors close. At door separations of 18" or less the secondary protection system may cease its normal operation since the depth of the zone recedes to where it is inside the hoistway doors. The vertical coverage of the secondary protection shall be ~19" (480 mm) above the sill to ~55" (1400 mm) above the sill (mid-thigh to shoulder of a typical adult).
6. The secondary protection shall have an anti-nuisance feature which will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever detection occurs in the primary zone.
7. The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled
8. If the electronic detector is activated when the doors are closing and the doors are more than one-third closed, they shall reverse direction and open only partially. The doors shall begin to re-close when the electronic detector is deactivated. The doors shall reopen fully if the electronic detector is activated longer than a fixed time.
9. The current door hold open time shall be changed to a shorter field programmable time when the electric eye is activated.
10. Nudging: The doors remain open as long as the electronic detector senses the presence of a passenger or object in the door opening if door movement is obstructed for a field programmable time value, a buzzer shall sound and the doors will close at reduced speed. If the reversing edge contacts a person or object while closing, the doors will stop and resume closing after the obstruction has been removed.
 - a. When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied. This shall overcome any mechanical resistance or differential air pressure and allow the door to close.

E. Interconnect elevator control system with building fire alarm, and smoke alarm system.

F. Temporary Elevator Use: If temporary use is required and approved in writing by the Owner, enclose elevator as follows:

1. Enclose cab with protective plywood on floor, walls, and ceiling.
2. Provide temporary lighting.

3. Provide control panel with manual and emergency operation.

1.05 OPERATION-GENERAL

- A. Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons.
- B. Motion Control: The drive control system shall be a dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.

1.06 OPERATION

- A. Automatic Microprocessor Control: Dispatcher functions shall be resident in each car controller. Equipment shall be easily reprogrammable, microprocessor based and make use of serial data transmission, high-integration circuitry, custom circuits as appropriate, and low-voltage I/O and peripherals, insuring efficient service to all floors.
 1. The microprocessors shall collect data and constantly monitor all necessary information with regard to location of car and corridor calls and current status of the elevator system. With the data, the system shall calculate the ETA of all cars using a programmed velocity/distance formula based on real-time response, current availability and status. The car with the best ETA shall be assigned.
 2. System information shall be scanned continuously, at least five times per second. If the conditions change after the initial car assignment, the microprocessor shall re-assign the car that can be best respond.
- B. Monitoring: A monochrome video monitor shall be provided in the Machine Room. The following shall be the minimum items monitored and evaluated for system analysis:
 1. Car Position, Direction, Status
 2. Motor Drive, Power Status
 3. Previous Car Assignments
 4. Car Door Position
 5. Existing Car Calls
 6. Car Load
 7. Dispatch Lobby Status
 8. Coincident Calls
 9. Adjacent Cars
 10. Corridor Assignments
- C. The system must be capable of reversing the direction of an empty car without making a stop at a floor. However, the system shall not allow registration of trailing car calls against the direction of the car.
- D. In the event a car is delayed for more than 30 seconds, it shall be removed from the system calculation.

- E. Primary Dispatching Failure: In the event of primary dispatching mode failure, the following dispatching modes shall be available.
- F. Firefighters' Emergency Recall: An emergency return system shall be provided in full compliance with the latest state, local and ASME Code requirements. Heat, smoke and products of combustion sensing devices (sensors) and sensor wiring to the elevator controller shall be provided in Division 16.
- G. Independent Service: Independent service shall be available to remove a car from the bank service. It is established by activating the independent service switch, located behind the recessed panel in the front return. When the switch is closed, the car is removed from bank operations and all its existing car calls shall cancel. Registering a car call shall initiate door closing and travel to the chosen floor. On arrival, the doors shall open and remain open until another car call is registered. The car shall respond to only one call at a time, and all other car calls shall cancel after the car makes its first stop. The car is restored to normal bank or normal single car operation by turning off the Independent Service Switch.

1.07 INDEPENDENT SERVICE

- A. Provide key operated "Independent Service" on car operating panel. Key activation shall remove that car from normal operation and cancel all pre-registered car calls.
- B. Car shall respond to selected floor. Car shall not respond to any calls from hall call buttons but only respond to calls placed on the car operating panel. Doors shall remain open at last landing requested and close with a constant pressure on "DOOR CLOSE" button.
- C. Key activation to normal operation shall return car to normal operation.

1.08 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Shop Drawings: Indicate the following information:
 - 1. Machine, counterweight, controller, selector, governor and other component locations.
 - 2. Car, machine beams, guide rails, buffers, and other components in hoistway.
 - 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - 4. Individual weight of principal components; load reaction at points of support.
 - 5. Loads on hoisting beams.
 - 6. Clearances and over travel of car.
 - 7. Location of components in machine room.
 - 8. Locations in hoistway and machine room of connections for car light and telephone.
 - 9. Location and sizes of access doors, doors, and frames.
 - 10. Expected heat dissipation of elevator equipment in machine room.
 - 11. Electrical characteristics and connection requirements.
 - 12. Show arrangement of equipment in machine room so moving elements and other equipment can be removed for repairs or replaced without disturbing other components. Arrange equipment for clear passage through access door.

- C. Product Data: Provide data on the following items:
 - 1. Signal and operating fixtures, operating panels, indicators.
 - 2. Cab design, dimensions, layout, and components.
 - 3. Cab and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- D. Samples: Submit two samples, 3 x 4 inch in size illustrating cab interior finishes, and cab and hoistway door and frame finishes.

1.09 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Submit four (4) copies of bound maintenance manuals for each elevator or group of elevators. Include record (as-built) drawings, one-line wiring diagrams for power, lighting, signals, controls and communications, full maintenance and operating instructions, parts lists, recommended spare parts and emergency parts inventory, sources of purchase and similar information. Include engineering data for microprocessor based systems.
- A. Diagnostic Test Equipment and Instructions: Diagnostic test device together with one set of all supporting information necessary for interpretation of test data and troubleshooting of system. The instruction period for use of the controller diagnostics and interpretation of test results by Owner's maintenance personnel shall not be less than one eight-hour day for the work included under this section. All diagnostic test devices and instruction material shall be furnished to the Owner along with any passwords required for operation at no extra cost and shall not be date or time sensitive
- B. Include a parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
- C. Provide technical information for servicing operating equipment.
- D. Include legible schematic of hydraulic piping and wiring diagrams of installed electrical equipment, and changes made in the Work. List symbols corresponding to identity or markings on machine room and hoistway apparatus.
- E. Provide one copy of master electric and hydraulic schematic and one copy of lubrication chart, each framed with clear plastic; mount on machine room wall.
- F. Provide field adjusting and diagnostic tool required for the microprocessor.

1.10 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME/ANSI A17.1 current edition with latest amendments, ANSI/AWS D1.1, NFPA 70, AISC, and as supplemented in this section.
- B. Fire Resistance: Comply with NFPA Standard No. 80 for construction and installation of hoistway entrances. Provide each door unit bearing UL label of approval ("B" label, except as otherwise indicated) as a "Fire Door" for hoistway construction indicated. Where required by

NFPA Standard No. 80, provide separate UL labels of approval on hardware, sills, closers and other accessory items of hoistway entrances.

- C. Trademarks: Do not display manufacturer's name or trademark on exposed surfaces of materials or components, which can be seen by passengers using the elevator system except where trademark is an integral part of a standard component.
- D. Contractor shall comply with R.S. 40:1664.1, et seq. and all requirements from licensing included in the Memorandum 4-2020 from the Office of State Fire Marshal dated July 2, 2020

1.11 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- B. Installer: Employees and supervisor on payroll of elevator equipment manufacturer or a franchised company of that manufacturer which specializes in performing the work of this section.

1.12 REGULATORY REQUIREMENTS

- A. Conform to applicable code for manufacture and installation of elevator system.
- B. Conform to ANSI A117.1 and ADA for provisions for the physically handicapped.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated and complying with the National Electrical Code.

1.13 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section; see Section 01200.
- B. Require attendance of persons directly involved with the work of this section.
- C. Review schedule of installation, installation procedures and conditions, and coordination with related work.
- D. Review temporary use of elevator, hours of use, scheduling of its use, cleanliness of cab, employment of operator, maintenance of system.

1.14 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

1.15 SCHEDULING

- A. Schedule work to permit early use of Elevator for construction purposes.

1.16 WARRANTY

- A. Materials and workmanship shall be first-class in every respect and that defects not due to ordinary wear and tear occurring within one (1) years from the date of acceptance shall be corrected. Warranty service shall be provided for each elevator for a period of 12 months after date of final acceptance by Architect. Warranty service shall be performed only by trained elevator mechanics and shall include manufacturer's warranty requirements including but not limited to adjusting, lubricating, repairing and cleaning of equipment and furnishing supplies and parts to keep elevators in operation, except parts made necessary by misuse, accident, or negligence not caused by Elevator Contractor. Testing and adjustments shall be in accordance with applicable provisions of ASME A 17.1 and ASME A 17.2. Emergency call back service shall be included and available 8 hours a day, 5 days per week, (normal work week, with response time of one hour or less for a maintenance mechanic to be on site. Inspection and service for fire service and testing, and certification of successful operation shall be provided with each unit
- B. Defective items shall be removed, replaced or repaired without expense to the Owner at the convenience of the Owner. Any damages to the building or any other work resulting from defects in the work of the Contractor's actions in removing, repairing or replacing the defective work shall be the responsibility of the Contractor.
- C. The Contractor and Elevator Subcontractor shall jointly guarantee the equipment to perform in complete accordance with the characteristics, rating, capacities, and speeds required by the Contract Documents.

1.17 MAINTENANCE SERVICE

- A. Furnish service and maintenance of elevator system and components for twelve (12) months from date of Substantial Completion to include 24 hours-per-day, 7 days-per-week emergency service with maximum eight (8) hour callback service.
- B. Examine system components bi-monthly. Clean, adjust, and lubricate equipment.
- C. Include systematic examination, adjustment, and lubrication of elevator equipment; maintain hydraulic fluid levels. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment. Replace wire ropes when necessary to maintain the required factor of safety.
- D. Perform work without removing cars during peak traffic periods.
- E. Provide emergency call back service at all hours for this maintenance period within one hour of that call.
- F. Maintain locally, near the place of the work, an adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure the fulfillment of this maintenance service, without unreasonable loss of time.
- G. Perform maintenance work using competent and qualified personnel, under the supervision of the elevator manufacturer or original installer.
- H. Maintenance service shall not be assigned or transferred to any agent or Subcontractor

without prior written consent of the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: “Gen 3 Core 3,500” by Otis Elevator Co or equal by ThyssenKrupp,.

2.02 MATERIALS

- A. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial-quality carbon steel, complying with ASTM A366, matte finish.
- B. Sheet Steel (for Unexposed Work): Hot-rolled, commercial-quality, carbon steel, pickled and oiled, complying with ASTM A569.
- C. Structural Steel Shapes and Plates: ASTM A6, ASTM A36, ASTM A108.
- D. Stainless Steel: Alloy 302 or 304 complying with ASTM A167, with standard temper and hardness required for fabrication, strength and durability.
 - 1. Exposed Surfaces: Apply mechanical finish (Federal Standard and NAAMM nomenclature) on fabricated work in the locations shown or specified, with texture and reflectivity required to match elevator manufacturer's standard #4 satin (120 grit) and #8 mirror finishes where specified herein. Protect with adhesive plastic covering. The grain of belting shall be in the direction of the longest dimension.
- E. Aluminum: Extrusions per ASTM B221,
- F. Plastic Laminate: ASTM E84 Class A and NEMA LD3, Fire-rated Grade (FR-50), 0.05" thick; color and texture as follows:
 - 1. Exposed Surfaces: Elevator manufacturer's standard color and texture selected by Architect.
 - 2. Concealed Surfaces: Elevator manufacturer's standard color and finish.
- G. Fire Retardant-Treated Particleboard Panels: Minimum 0.44" thick backup for natural finished wood and plastic laminate veneered panels, edged and faced, provided with suitable antiwarp backing; meet ASTM E84 Class "I" rating with flame-spread rating of 25 or less, registered with Local Authorities for elevator finish materials.
- H. Paint: Clean all surfaces receiving a baked enamel finish of oil, grease, scale, etc. Apply one coat of rust-resistant alkyd paint followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of alkyd paint.
 - 1. Clean exposed metal of oil, grease, scale and other foreign matter and factory paint one shop coat of manufacturer's standard rust-resistant primer.
- I. Galvanize: Clean metal of oil, grease, scale and other foreign matter, pickle and factory dip all unfinished metal surfaces.

2.03 HOISTWAY EQUIPMENT

- A. Buffers: Oil buffers shall be installed in the elevator pit under the car and in the counterweight and provide means for visually checking oil level. Include all blocking, struts, braces required to support buffers and a switch on the buffer to limit car down travel when the buffer is compressed.
- B. Pit Switch: A disconnect switch which, when activated, shall prevent operation of the elevator, shall be provided adjacent to the pit access ladder in the elevator pit.
- C. Counterweight: A counterweight consisting of a steel frame and subweights to balance the car and approximately 40 percent of the contract load shall be supplied. The subweights shall be contained within a steel frame.
 - 1. A counterweight guard shall be provided in the pit unless compensation is provided.
- D. Guide Rails: The car guide rails shall be accurately machined, standard-section, planed-steel tee guide rails with tongue-and-grooved joints, weighting not less than specified in the ASME Code. The rail sections shall be joined together in accordance with the requirements of the Code. Provide an 80 micro-inch finish on all tongue and groove machined surfaces and a 60-80 micro-inch finish on the riding surfaces of the guide rail.
 - 1. The guide rails shall be erected plumb within 1/32" per every 100'. They shall be properly located and suitably bottomed in the pit and shall extend the full height of the hoistway.
- E. Hoist Ropes: The elevator shall be equipped with traction steel ropes of sufficient size and number to give proper wear and traction. As a minimum, the number of ropes shall comply with the factor of safety requirements of ASME A17.1 Code. Each rope shall consist of at least six strands wound about a hemp core center.
 - 1. The governor rope shall be of sufficient size to accommodate governor operation. The governor rope is to pass over the governor sheave and over the tension device at the bottom of the hoistway forming a closed loop.
- F. Deflector Sheave: An accurately grooved deflector sheave shall be provided to route the hoist ropes from the machine drive sheave to obtain a plumb lead to the counterweight.
- G. Governor Tension Device: A device shall be provided in the pit forming a closed loop with the overspeed governor. The device shall be spring tensioned to minimize rope slippage.
- H. Trail cables shall be of the proper size and grade for the service indicated. The flexible outer cover shall be flame and moisture-resistant.

2.04 EQUIPMENT - GENERAL

- A. Motor, Controller, Controls, Buttons, Wiring and Devices, Indicators: Required by ANSI/NFPA 70.

- B. Guide Rails, Cables, Polyurethane buffer, Attachment Brackets and Anchors: Purpose designed, sized according to code with safety factors.
- C. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and operational control. Locate controller{s} in an integral cabinet adjacent to the entrance frame at the indicated landing of the elevator
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- D. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- E. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current
- F. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- G. Hoistway Operating Devices:
 - 1. Emergency stop switch in the pit.
 - 2. Terminal stopping switches.
 - 3. Emergency stop switch on the machine

2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics:
 - 1. See drawings for electrical service.
 - 2. Starter Characteristics: Solid State WYE - Delta Starter.
- B. Disconnect Switch: Refer to Division 16 for disconnect switch to be installed in control panel.

2.06 ELECTRICAL COMPONENTS

- A. Boxes, Conduit, Wiring, and Devices: Required by ANSI/NFPA 70.
- B. Fittings: Steel compression type for electrical metallic tubing. Fittings with set screws are acceptable only when a separate grounding conductor is also installed across the joint.
- C. Spare Conductors: Include 10 percent extra conductors and two pairs of shielded audio cables in traveling cables. Do not parallel conductors to increase electric current capacity unless

individually fused.

- D. Do not use armored flexible metal conduit as a grounding conductor.
- E. Include wiring and connections to elevator devices remote from hoistway and between elevator machine rooms. Provide additional components and wiring to suit machine room layout.

2.07 LUBRICATION

- A. Grease Fittings: For lubricating bearings requiring periodic lubrication.
- B. Grease Cups: Automatic feed type.
- C. Lubrication Points: Visible and easily accessible.

2.08 CAR AND COUNTERWEIGHT GUIDES AND GUIDE SHOES

- A. Guides for the elevator car and counterweight shall be planed steel elevator guide rails, properly fastened to the building structure with steel brackets. Roller guides consisting of a minimum of three tires, shall be mounted on top and bottom of the car and counterweight frame, and shall be held in contact with the guide rail by adjustable devices. Roller guides shall run on dry, unlubricated rails.
- B. Safety and Governor: The car and counterweight shall be mounted on the bottom members of the car frame and shall be operated by a centrifugal speed governor located over the hoistway. The governor will be designed to cut off power to the motor and apply the brake whenever the governor indicates the car or the counterweight have excessive speed.

2.09 CAR FABRICATION

- A. Frame: Rigid and braced, rolled or formed steel sections, mounted on resilient isolators.
- B. Platform: Steel frame, with fireproofed plywood subflooring assembly, ready to receive floor finish.

2.10 CAB FABRICATION

- A. Car Frame: A carframe fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the carframe and shall be Type "B", flexible guide clamp type.
- A. Platform: Accommodate specified thinset terrazzo floor tiles specified in Section 09400.
- B. Walls: Stainless steel panels
- C. Canopy: Unitized steel construction with emergency exit.
- D. Front Return Panel: Stainless steel with integral swing return operating devices, and telephone cabinet flush with return panel.

- E. Ceiling: Solid polished stainless steel panels with minimum of six (6) LED downlights
- F. Cab Wiring: All wiring on the elevator cab shall use factory wired harnesses with Wago® Cage Clamp® plugs and receptacles, and shall terminate behind the car operating panel. Provide a 125-volt 15-ampere utility outlet with ground-fault circuit-interrupter protection shall be furnished on top of the cab
- G. Ventilation: One speed exhaust fan in ceiling; perforations in base.
- H. Control Panel and Face Plate: No. 4 non-directional stainless steel with illuminating call buttons. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons and illuminating indications shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided; design: **Provide one (1) operating panels at the front cab entrance and one (1) at the rear cab entrance**
- I. The following cab fixtures shall also be provided:
 - Car Lantern(s)
 - Digital Car Position Indicator
 - Locking Service Panel in Car Operating Panel
 - Telephone (ADA compliant)
- J. Hand Rail: Stainless steel 1-1/2"; rear and both sides
- K. Pad Hooks and Pads: Stainless steel type, mounted at standard height, in all cabs. Provide one set (3 sides) of fire-retardant elevator protection pads.
- L. Protective Pads: One set, canvas cover, padded with cotton wadding fill material, sewn with piping edges; brass grommets spaced to match pad hook spacing in cab, covering side and rear walls and front return, except cut-out for control panel.
- N. Emergency Car Lighting: An emergency power unit employing a 12 volt, sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
- O. Emergency Pulsating Siren: Siren mounted on top of the car that is activated when the Alarm button in the car-operating panel is engaged. Siren shall have a rated sound pressure level of 80 dba at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.
- P. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit where required by code.
- Q. Exhaust Fan: Mounted on the car top.
- R. Roller Guides: Rubber roller guides shall be mounted on top and bottom of the car.
- S. ASME A17.1, Rule 204.1e. Provide an emergency exit in the top of the car. Arrange the car top exit to open only from outside of the car, without the use of tools. Equip the exit with a non-self-resetting contact which shall prevent operation of the car unless the exit panel is fully

closed. Cause alarm system to sound when the exit door opens.

- S. Platform: The car platform shall be of all steel construction with a 5/8" (16 mm) sheet of plywood overlay. It shall be equipped with brushed stainless finish. threshold. Load weighing device shall be mounted under the platform.

2.11 CAB ENTRANCES

- A. Cab Doors: Stainless steel , 14 gage thick metal, of hollow rigid construction, flush design.
- B. Cab Door Frames: Stainless steel of equivalent thickness and strength of 16 gage steel.
- C. Thresholds: Extruded aluminum.

2.12 HOISTWAY ENTRANCES

- A. Two (2) hour fire rated assembly.
- B. Hoistway Doors: Stainless steel; 16 gage thick metal, of hollow sandwich panel construction with vertical internal channel reinforcements, flush design, rigid construction..
- C. Hoistway Door Frames: Stainless steel; 14 gage thick metal, of rolled profiles, bolted construction. Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway.
- D. Door and Frame Construction: UL 1-1/2 hour fire rating; insulated sandwich panel door construction 1- 1/4 inch thick, minimum.
- E. Sills: Extruded aluminum.
- F. Entrance Markings: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille adjacent. Markings shall be provided on both sides of the entrance.
- G. Furnish black sight guards

2.13 FINISHES

- A. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- B. Machine Room Components: Clean and degrease; prime one coat, finish with one coat of enamel.
- C. Galvanized Surfaces: Clean with neutralizing solvent; prime one coat.
- D. Aluminum: Clear anodized finish.
- E. Wood Surfaces not Exposed to Public View: One coat primer; one coat enamel.
- F. Stainless Steel: No. 4 brushed.

2.14 CAR OPERATING PANEL

- A. Provide two (2) flush mounted operating panel per car with an integral swing front return panels containing illuminated call buttons corresponding to floors served, in car alarm button, and DOOR OPEN, DOOR CLOSE buttons. Series 1: Applied car operating panel shall be furnished. It shall contain a bank of square mechanical illuminated buttons marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have both raised and Braille markings. LED (red) button illumination with 1/8" projecting target. Round mechanical buttons are acceptable. Finishes: "#4 non-directional stainless
- B. Position alarm button where it is unlikely to be accidentally actuated; not more than 35 inches above cab floor.
- C. Include services integral with front return panel and containing:
 - 1. Independent service switch.
 - 2. Fan or blower switch.
 - 3. Light switch.
 - 4. Telephone cabinet and telephone instrument.
 - 5. Additional operating switches for the special features specified.
- D. Car Position Indicators: A 16-segment, digital, vacuum fluorescent car position indicator shall be integral to the car-operating panel
- E. Emergency Light: Internal above car position indicator.
- F. A hands free digital telephone shall be provided which is designed in response to ADAAG requirements integral with the car operating panel. Telephone shall be provided with direct dial up to security station.
- G, Help Button – The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
- H. Firefighter's Phase II emergency in-car operating instructions, worded according to A17.1 2000, Article 2.27.7.2.
- I. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
- J. Please exit symbol, provided with emergency hospital service, Seismic Zones ≥ 2 or express priority in the hall.
- G. Direction arrows to be located at car operating panel

2.15 EQUIPMENT AND FIXTURES

- A. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.
- B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. 3 with full satin stainless finish.
- C. Hall Lantern and Chime: A directional lantern visible from the corridor shall be provided in the Hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
 - 1. Hall fixtures shall feature round metal (plastic when required by some California codes) mechanical buttons marked to correspond to the landings, in raised fixture housings. Buttons shall be 1/8" projecting targets in vertically mounted fixture. Hall lanterns and Position indicators shall be illuminated by means of LED. Fixture shall be full satin stainless steel finish.
- D. Flood Operation: prevent the car from being submerged under water during a flood. Include a float switch and a reset button. When the float switch is activated, the flood operation is initiated and the following operation takes place:
 - 1. The car is immediately returned to the Designated Flood Elevation position.
 - 2. At this position, the car buzzer and "Please exit" jewel are activated, and the doors remain open for a specified door time.
 - 3. When the door time expires, the doors close and the car remains at the Designated Flood Elevation position on Flood Operation. The car remains unavailable to answer calls. The buzzer is terminated.
 - 4. Flood is cleared whenever the reset button is activated while the float switch is inactive.

Phase I and II, are permitted to operate during Flood Operation. However, landings below the Designated Flood Elevation are disallowed, as long as the float switch is active

2.16 PROVISION FOR HANDICAPPED

- A. Comply with ANSI A117.1 and ADA.
- B. Provide indicators near controls in conformance with ANSI A117.1 and ADA.
- C. Location of highest button in elevator cab control panel and the center of the telephone handset.
- D. Sound audible tone signal in car when car is stopping at a floor .
- E. Include with illuminated landing indicators, audible tone signals; once for UP stops and twice for DOWN stops.
- F. In each cab provide Arabic raised Braille numerals immediately to left of floor buttons to identify each floor.
- G. At each floor landing provide raised floor numerals.

2.17 NOISE CONTROL AND VIBRATION ISOLATION

- A. Mount open steel spring with neoprene vibration isolators under power unit baseplate assembly. Provide 1" static deflection.
- B. Provide 36 inch long flexible electrical connections.

2.18 PAINTING:

- A. Elevator Contractor shall paint equipment, hangers, machine room floor, pit floor and accessories in mechanical equipment rooms, with two (2) coats of approved paint after thoroughly cleaning. Equipment having factory finish, if damaged or scratched, shall be touched up and given one additional coat of machinery enamel.
- B. Elevator drive machine, motors, controllers, and the like shall be factory painted with manufacturer's standard finish and color.
- C. Surfaces (except contact surfaces of working parts) of elevator items such as controller, car frames, underside of platform, guide rails, rail brackets, and all uncoated ferrous metal items, shall be given zinc chromate or approved equal prime coat.
- D. Upon completion of installation and prior to final inspection, all equipment shall be thoroughly cleaned of grease, oil, cement, plaster, and other debris. All equipment, INCLUDING DOORS AND DOOR FRAMES except that otherwise specified as to architectural finish, shall then be given two coats of paint of color approved by the Architect.
- E. Paint floor designation numbers not less than four-inch high, on hoistway doors, facias and/or walls as required by CODE. The color of the paint used shall contrast with the color of the surfaces to which it is applied.
- F. Fascia plates, toe guards, dust covers, hanger covers, and other metal shall be thoroughly cleaned and given one field coat of paint of color approved by the Architect.
- G. Interior and exterior steel surfaces of Elevator Cabs shall be parkerized or given equivalent rust resistant treatment before finish is applied.
- H. Interior surfaces of Elevator Cabs shall be factory finished with one coat of baked on enamel or poxylin lacquer.
- I. Exterior faces of Elevator Car doors shall be given one finish coat of oil base paint approved by the Architect.
- J. Elevator drive machine, controller, disconnect switch, governor and crosshead of car shall be identified by 4 inch high numerals and letters located as directed by the Architect. Color of numbers shall contrast with color surfaces to which they are applied.

2.19 KEYS:

- A. Provide five (5) sets of all keys pertaining to the operation of the elevators. The keys shall

include firefighter service, independent service, stop switch, inspection, hoistway access, fan, lighting, and any other key for the elevators and control panels

- B. Provide elevator keys, to allow all elevators to operate in fire emergency situations with one master elevator key, in accordance with all provisions of this statute, including the following:
 - a. Issue master elevator keys ONLY to authorized personnel, including the fire department in whose jurisdiction the building is located.
 - b. Master elevator keys shall NOT be issued to any emergency response agency, other than the authorized fire department personnel.
 - c. Master elevator keys shall NOT be duplicated without specific authority and approval.
 - d. Every master elevator key shall be marked "DO NOT DUPLICATE"

2.20 BRAKE AND BRAKE ASSEMBLIES:

- A. The brake assembly shall stop and hold the car under all conditions of loading or operation with the rated load and contract speed. The wearing surface and the edge of the flange shall be turned smooth and balanced. The wearing surface shall run true and be adjusted to run within a maximum variation of 0.005 inch. The brake shoes shall be of non-asbestos components and shall be lined with a suitable fireproof friction material so shaped to the shoe that the drum will run free with a normal clearance. The brake application shall be automatically controlled to obtain noiseless, smooth, and gradual stops with either light or loaded car in either direction of travel. The circuit of the brake magnet shall be opened:
 - 1. by the normal stopping of the car.
 - 2. upon failure of any of the several units of equipment to function properly for safe operation of the car by various safety devices.
 - 3. when safety switch(es) open.
 - 4. power failure

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that hoistway, pit, and machine room are ready for work of this section.
- B. Verify hoistway shaft and openings are of correct size and within tolerance.
- C. Verify that electrical power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install in accordance with ANSI/ASME A17.1.
- B. Install system components. Connect equipment to building utilities. Install piping between hoistway plunger and pump unit.
- C. Provide conduit, boxes, wiring, and accessories.
- D. Mount motor unit on vibration and acoustic isolators, on bed plate and concrete pad.

- E. Accommodate equipment in space indicated.
- F. Install guide rails using threaded bolts with metal shims and lock washers under nuts. Compensate for expansion and contraction movement of guide rails.
- G. Accurately machine and align guide rails. Form smooth joints with machined splice plates.
- H. Bolt or weld brackets directly to structural steel hoistway framing.
- I. Field Welds: Chip and clean away oxidation and residue, wire brush; spot prime with two coats.
- J. Coordinate installation of hoistway wall construction.
- K. Install hoistway door sills, frames, and headers in hoistway walls. Grout sills in place. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.
- L. Adjust equipment for smooth and quiet operation.
- M. Clearance around elevator, mechanical and electrical equipment shall comply with applicable provisions of NEC (NFPA 70). Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in same machine room. Locate controller near and visible to its respective drive machine and disconnect switch.
- N. Provide sheet-metal and angle-iron guards at all openings in the machine room floor to protect personnel from accidental contact with the ropes. Openings and recesses in the machine room floor shall be covered with sheet metal or filled with concrete. The machine room floor shall be substantially flush, smooth and void of any tripping hazard.
- O. Caulk around and seal all piping and duct penetrations through building members, hoistway enclosure, machine room enclosure, and ceilings with non hardening sealant. Where slabs and walls are fire - rated, sealants shall have the same fire – rating. Comply with Section 072700.

3.03 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other within 1/32" per every 100' in accordance with ANSI/ASME A17.1 and ANSI/ASME A17.2.
- B. Cab Movement on Aligned Guide Rails: Smooth movement, with no objectionable lateral or oscillating movement or vibration.

3.04 FINAL INSPECTION & TESTS

- A. Test Notification: When the elevator work included in the contract is fully complete. Prior to scheduling final inspections and tests, a minimum 72 hours written notification, shall be given by Contractor to the Architect, that elevators are ready for final inspection and tests. The Elevator Contractor shall be fully responsible to perform all tests and demonstrate the proper operation of all parts and provisions of the equipment.

Contractor shall prove to the satisfaction of the Architect and the Elevator Inspector that the elevator, as installed, complies with the requirements of this contract and all applicable requirements of ASME A17.1.

- B. Inspection Procedure: Upon nominal completion of each elevator installation, and before permitting use of the elevator (either temporary or permanent), perform acceptance tests as required by governing regulations in the presence of the Owner's Elevator Inspector. Comply with ASME A17.2, Part II, "Standard Practices for the Inspection of Elevators".
 - 1. Contractor shall demonstrate that the performance of the elevator as specified has been provided.
- C. Testing Materials And Instruments: The Contractor shall furnish all test instruments, gauges and material required for final inspection. Include standard 50-pound test weights, an insulation "Megger" 600 volt, alternating current volt meter and ammeter, three (03) Celsius calibrated thermometers, spirit level, stop watch, and a direct reading tachometer.
- D. Diagnostic Testing Device: Diagnostic testing device or maintenance terminal suitable for all trouble shooting procedures related to the specific type microprocessor controls and drives installed on this project, shall be provided.
 - 1. This diagnostic testing devices and/or maintenance terminals shall be demonstrated and tested during final testing of the elevator installation. A series of not less than ten simulated malfunctions shall be diagnosed properly by the device. A period of at least 2 hours shall be dedicated to the instruction of its use to the Architect.
 - 2. After successful testing of the diagnostic device in conjunction with the microprocessor controls, the testing device(s) shall become the property of the "State of Louisiana".
 - 3. The diagnostic testing device(s) shall be equipment to be Fully maintained by the Elevator Contractor under contract with the "State of Louisiana".
 - 4. Contractor shall provide Password or Code to access control equipment and drives to the Architect.
- E. Final Inspection: In addition to any other tests, make the following tests at the time of the final inspection, as follows:
 - 1. Test Period: Subject elevator to a test for a period of one hour continuous run, with specified rated load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of 5 seconds per floor. Provide a manual test of the final limits (up and down over travel). No component will be permitted to fail.
 - 2. Speed Load Test: Determine the actual speed of the elevator car, in both directions of travel with the rated load and with no load in the elevator car. Make speed tests before the rated - load test run and also after the rated load test run. Determine speed by applying a tachometer. The actual measured speed of the elevator car with the rated load in the up and down direction shall be within 5 percent of the rated contract speed. The maximum difference in actual measured speeds obtained under the various conditions outlined shall not exceed 5 percent of the total difference between the "UP" and "DOWN" directions.

3. Car Leveling Tests: Test elevator car leveling devices for accuracy of landing at all floors with no load in the car, symmetrical load in the car, and with the rated load in the car in both directions of travel.
 - a. Determine accuracy of floor landing both before and after the rated full-load run test. Measure leveling tolerances, using a 1800 mm straightedge laid flat on higher of two surfaces, shall be plus or minus 1/8 inch under ever rated loading condition.
4. Insulation Resistance Tests: Complete wiring systems of the elevator shall be free from short circuits and grounds. The insulation resistance shall be determined by use of a "Megger". Conductors shall have an insulation resistance of not less than one megohm between each conductor and all other conductors.
5. Temperature Rise Tests: Determine temperature rise of drive machine, drive motor and controller, during the full-load test run for a minimum of one hour. Under these conditions the temperature rise of the equipment shall not exceed 55 degrees C. above ambient temperature.
 - a. Start the test only when all parts of the equipment are within 5 degrees C of the ambient temperature, at the time of starting the tests.
6. Reports: Test reports on the following tests shall be submitted for the elevator systems in accordance with ASME A17.1 and A17.2.
 - a. Continuous - operations tests
 - b. Temperature rise test
 - c. Acceptance Inspection and test
7. Records: The Contractor shall provide on-site records of each inspection and test performed throughout the life of the contract.

Contractor shall keep records that include, but not limited to, factual evidence that the required inspections and/or tests have been performed, including type and number of inspections or tests involved, identification of operators and inspectors, result of inspections or tests, nature of defects, causes for rejection, proposed remedial action, and corrective actions taken.

8. Certification: Perform and furnish certification for the tests required by A17.1 Section X and Rule 1003. Certification must state that each car safety device, buffer, and overspeed governor has been tested and approved for use with the equipment having the specific ratings indicated or specified.
 9. Re-Inspection: If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform with the requirements of the contract specifications or the Elevator Safety Code, no certificate of approval shall be issued, until all defects have been corrected. When non conforming items, parts, test failures, defects, repairs and adjustments have been completed and the discrepancies corrected, the Architect shall be notified and the elevator will be re inspected at the Elevator Contractor's expense. Do not use a rejected elevator until it has been re inspected and approved.
- F. Perform the following tests in the presence of the Owner and Architect:
1. Test elevator system by transporting at least 6 persons up from main floor during a five minute period and at rated capacity.
 2. Time elevator travel between typical floors to compare to rated speed. Measure time from moment doors start to close until car has stopped level at next floor and doors are opening.
 3. Stopping accuracy.
 4. Operation of signal fixtures and supervisory system.

3.05 PERFORMANCE

- A. Contract Speed: Actual speed shall vary no more than $\pm 3\%$ for speed specified under any loading condition or direction of travel.
- B. Leveling Accuracy: Cars shall level consistently within $\pm 1/8"$ under loading conditions.
- C. Door Times as follows:
 - 1. The door-opening time, measured from the instant the doors start to open until within 1" of the fully open position, shall not exceed 1.7 seconds for 42" single speed center opening doors.
 - 2. The door closing time shall comply with ASME A17.1 and local codes.
 - 3. Long door and short door "hold open" times shall be set at 4.0 and 2.5 seconds respectively. The door close pressure shall be set per code requirements.
- D. Door Nudging Time: The time from when the door is blocked until nudging feature starts shall comply with ASME A17.1 and local codes and shall not be less than 20 seconds.
- E. Floor-to-Floor Time as follows:
 - 1. Floor-to-floor time shall be measured from start of door close to door three-quarters open at the next consecutive floor. Based on 12'-0" typical floor heights, the maximum time the elevator requires to start moving, once the elevator interlock circuit has been established, shall not exceed 1.0 second.
 - 2. Floor-to-floor time shall not exceed the number of seconds equating to specified speed.
 - 3. Flight time, brake relay pick to brake relay pick, shall not exceed 5.0 seconds.
- F. Motion Control: The half-amplitude peak acceleration within the elevator cab during all riding and door operating conditions shall not exceed 15 mg in the 2-30 Hertz range. Acceleration and deceleration of the elevator car shall not exceed five feet per second squared. The jerk rate shall not exceed 12 feet per second cubed.
- G. Noise: Minimize noise and vibration in occupied areas. Isolate elevator equipment (including hoist machines, deflector sheaves, drive units, etc.) from building structure. Limit machine room noise to NC70, specifically 360 Hertz vibration generated by excessive motor armature current ripple, the IEEE-85 (test procedure for airborne measurements on rotating electric machinery).
 - 1. Limit noise levels relating to elevator equipment and its operation to no more than 58 dB, measured on "A" scale, in the elevator cab under any condition including door operation and fan at highest speed.
- H. Performance:
 - 1. Car Speed: $\pm 3\%$ of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold up to 125% of rated load. (code required)
- I. Ride Quality:
 - 1. Vertical Vibration (maximum): 12 – 17 milli-g
 - 2. Horizontal Vibration (maximum): 10 – 15 milli-g
 - 3. Vertical Jerk (maximum): $4.6 \pm 1.0 \text{ ft./sec}^3$ ($1.4 \pm 0.3 \text{ m/sec}^3$)

4. Acceleration/Deceleration (maximum): $2.6 \pm .33 \text{ ft./sec}^2$ ($0.8 \pm 0.13 \text{ m/sec}^2$)
5. In Car Noise: 50 – 55 dB(A)
6. Stopping Accuracy: $\pm 0.2 \text{ in.}$ ($\pm 5 \text{ mm}$)
7. Re-leveling Distance: $\pm 0.4 \text{ in.}$ ($\pm 10 \text{ mm}$)

3.06 TESTS BY REGULATORY AGENCIES

- A. Testing by regulatory agencies will be performed at their discretion; documented by the Contractor under provisions of Section 01400.
- B. Obtain required permits to perform tests. Perform tests required by regulatory agencies.
- C. Schedule tests with agencies with Architect and Contractor present.
- D. Furnish test and approval certificates issued by jurisdictional authorities.

3.07 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- C. Adjust automatic floor leveling feature at each floor to achieve 1/8 inch from flush.
- D. Balance cars to equalize pressure of roller guides on the rails.
- E. Align guide rails within 1/32" vertically in 100 feet.
- F. Adjust roller guides on cars with guide rails to provide smooth movement with no perceptible lateral movement or vibration.
- G. Adjust motors: Power control devices; brakes; controllers; leveling, limit and stopping switches; door operators; interlocks; and safety devices to achieve specified performance levels.
- H. Lubricate all operating parts of system, including ropes, as recommended by manufacturer.

3.08 CLEANING

- A. Clean work under provisions of 01700.
- B. Remove protective coverings from finished surfaces.
- C. Clean surfaces and components ready for inspection.

3.09 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit construction traffic within cab after cleaning.

END OF SECTION

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A) The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this Section.
- B) Separation of specifications into sections is for convenience only and is not intended to establish limits of work or liability. The following are the Sections that will apply to this project.
 - (1) 15050 - Basic Materials and Methods
 - (2) 15500 – Fire Suppression System
 - (3) 15550 – Clean Agent Suppressions System
 - (4) 15250 - Piping and Equipment Insulation
 - (5) 15400 - Plumbing
 - (6) 15800 - Heating, Ventilation and Air Conditioning
 - (7) 15850 - Testing, Adjusting, and Balancing of Air Systems
 - (8) 15900 - Valves, Strainers, Unions and Fittings

1.2 REFERENCE STANDARDS

- A) The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B) All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C) All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the Contract Documents.

1.3 DEFINITIONS

- A) These definitions are included to clarify the direction and intention of these Specifications. For further clarification, contact the Architect/Engineer.
 - (1) Concealed / Exposed: "Concealed" areas are those areas that cannot be seen by the building occupants. "Exposed" areas are all areas, which are exposed to view by the building occupants, including under counters, inside cabinets and closets, plus all mechanical rooms. "Exterior" areas are those that are outside the building exterior envelope and exposed to the outdoors.
 - (2) Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
 - (3) Install: The term "install" is used to describe operations at Project Site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

- (4) Provide: The term "provide" means "to furnish and install, complete and ready for the intended use.

1.4 DESCRIPTION OF WORK

- A) The work to be done under this heading includes the furnishing of labor, materials, equipment, and service necessary for and reasonably incidental to the proper completion of all mechanical work as shown on the drawings and herein specified.
- B) Visit and examine the job site, and with all authorities concerned in order to become familiar with all existing conditions pertinent to the work to be performed thereon. No additional compensation will be allowed for failure to be so informed.
- C) Materials and equipment shall be new, except where otherwise indicated, of the best quality, with same brand of manufacturer for all similar material. All equipment shall be installed in accordance with manufacturer's requirements. Equipment with electrical components shall be laboratory tested.
- D) All work shall be performed in a neat and workmanlike manner, and in accordance with all codes, standards, and requirements of the industry. All workers shall be trained in the tasks they perform. Training shall be by an industry accepted trade school.
- E) In general, provide the installation of plumbing, fire protection and HVAC systems complete with all piping, fittings, fixtures, equipment, etc.
- F) Regardless of titles and subdivisions herein employed, consider these specifications as one complete document with General Section applying to all other sections. All bidders are cautioned to read entire specifications and to thoroughly familiarize themselves with all requirements thereof.
- G) Check all specifications and all drawings and bring to attention any conflicts or variations as shown as noted.
- H) Specifications and accompanying drawings apply to all contracts or sub-contracts entered into for supplying material or labor for construction of work specified herein and shown on drawings.
- I) Protect Owner and his agents including Construction Manager, Architect and/or Engineer from any and all damages and expense arising from fulfillment of contract and at completion of work repair all damages done.
- J) For any points which are not clear, or for items and/or details which the Contractor feels are in need of clarification, consult the Architect before submission of a proposal.
- K) The drawings and the specifications are complementary and what is shown and/or called for on one shall be furnished and installed the same as if shown and/or called for in the other.
- L) In case of discrepancies and/or ambiguities in the drawings and/or in the specifications, the Architect shall be consulted prior to submission of a proposal. Failure to do so on the part of the successful bidder shall be construed as explicit agreement on his part to abide by the Architect's decision in such matters.

- M) The word "provide" as used in these Specifications and on the Drawings shall be termed to mean "furnish and install".
- N) Contractor shall include in base bid the connection of all sewer, storm drain and water piping to mains as shown on the drawings. Contractor shall include all material and all costs for complete installation.
- O) If the Contractor notices during the bidding any items of the contract documents which will violate any applicable code, these items shall be brought to the attention of the Architect before the bid date. Failure to bring these items to the attention of the Architect shall be construed as explicit agreement that the Contractor has included in his bid price any and all modifications necessary to complete the project in accordance with all applicable codes.

1.5 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A) All exposed uninsulated piping, ductwork and other equipment requiring painting will be painted under PAINTING SECTION. Leave all these surfaces clean of oil, dirt, plaster, etc., ready for painting section's work.
- B) Power wiring for all equipment shall be done under ELECTRICAL SECTION.
- C) Provide approved wiring diagrams to the Electrical Contractor showing interlocking of all equipment and controls, assisting in all wiring problems affecting his equipment, checking and verifying that same is wired correctly under the Electrical Section for proper operating of all mechanical items.
- D) Furnish under this section all heating, air conditioning, ventilating and other mechanical systems controls, starters, firestats, relays, and related equipment.
- E) Openings for all access doors, relief and return air grilles, etc., shall be provided under the respective trade sections.
- F) Curbs, flashings, etc., for exhaust fans, vents, etc., shall be provided under the respective sections.
- G) All HVAC control wiring shall be furnished and installed by Building, Automation and Temperature Control Contractor.
- H) Piping and ductwork penetrations through fire rated partitions/floors shall be fire sealed in accordance with the UL fire resistance directory. See Joint Sealant Specification for materials. The integrity of the fire rating, as indicated on the architectural drawings, shall be maintained.

Manufacturers:

- (1) 3m Model 2000.
- (2) Spec Seal Model 100.
- (3) Hilti.

General Purpose Fire Stopping Sealant: Water based non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.

General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

Plastic Pipe Systems Fire Stopping Sealant: Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479 with metal collars.

1.6 QUALITY ASSURANCE

- A) The Contractor bidding on this portion of the work must be fully experienced in installations of equal size, complexity, and quality, and must be licensed to perform such work as required by the Louisiana State Legislature, R.S.37:2152-2163.
- B) In bidding he acknowledges that he fully understands the scope of work and design, and has the ability for the contract price to assemble and install the equipment, piping and ductwork shown or specified, so as to mold same into a satisfactory workable system and arrangement. Contractor shall be trained by the proposed manufacturer for the installation of the equipment. No work shall begin until the Contractor has adequate training and understanding of the equipment.
- C) Contractor shall recognize that a fault or error in his work remains his responsibility regardless of whether such difficulty was discovered after the work had progressed, and shall make corrections at no cost to the Owner.
- D) Adequate and competent constant supervision shall be provided by Contractor to assure that work is done in accordance with good standard practice and workmanship and with intent of drawings and specifications. Contractor shall recognize that amount of information and detail could be provided to contract documents is limitless and could extend into every minute detail and sequence of operations, to a point where only workmen would be required, without drawing on ability, experience and ingenuity of the Contractor.
- E) All work shall be installed in strict accordance, with all existing local and state codes and ordinances, with National Board of Fire Underwriters
- F) This Contractor shall secure all permits and inspections and shall pay all fees and taxes and shall provide Owner with certificates of approval from agencies having jurisdiction over various phases of work.
- G) Contractor shall maintain and service all equipment until time of acceptance by Owner. Contractor shall include all required service access in the installation as required by the manufacturer and governing codes.
- H) Prior to starting any work, the Contractor shall submit a quality assurance plan for approval by the Engineer. In the quality assurance plan, the Contractor shall provide the following information:
 - (1) List of all sub-contractors and equipment suppliers.

- (2) List of all foreman and job superintendents including job experience for all trades.
- (3) Construction time schedule demonstrating coordination with other trades and showing detailed time lines for test and balance and commissioning being completed prior to final punch list inspection.
 - a). Fire Suppression, Plumbing and HVAC systems shall be coordinated with other systems and trades to include but not be limited to: Electrical systems, fire alarm, security systems, telephone and data systems.
 - b). Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of Contractor's Work to the building structure and to the Work of all trades. The Contractor shall visit the premises and become thoroughly familiar with all details of the Work and working conditions, to verify all dimensions in the field, and to advise the Architect/Engineer of any discrepancy before performing any Work. Adjustments to the Work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner or the Architect/Engineer.
 - c). All dimensional information related to new structures shall be taken from the appropriate Drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the Site.
 - d). The Drawings are subject to the requirements of Reference Standards, structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of Work. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All exposed Work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
 - e). When the Drawings do not give exact details as to the elevation of pipe and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.
 - f). Where core drilling of floor or wall penetrations is required, Work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03 Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards, and be performed by licensed personnel where applicable.
 - g). Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

1.7 SUBMITTALS

A) Shop Drawings and Submittal Data required:

- (1) Submit to the Architect for review, complete descriptive information and dimensional data on all items of equipment, materials and accessories, including duct, piping, equipment and sprinkler layouts. Piecemeal submissions shall not be approved. Written approval thereof must be obtained before ordering or installation. The following shall be submitted:
 - a). Ductwork layout
 - b). Plumbing layout
 - c). Equipment room layouts
 - d). VRF systems
 - e). Packaged rooftop units
 - f). Plumbing fixtures
 - g). Water heaters
 - h). Coordination drawings
 - i). Piping materials
 - j). Insulation
 - k). Plumbing materials
 - l). Valves, strainers, unions & fittings
 - m). Ductwork accessories
 - n). Exhaust fans
 - o). Fire suppression system
 - p). Clean agent system
 - q). DOAS unit.
 - r). Fire and jockey pumps and controllers.
 - s). Air purification units
 - t). Temperature controls
- (2) Shop drawings and submittal data shall be considered to be instruments of service only and submitted for the sole purpose of convenience to the Contractor to assist him in the performance of the contract. The Architect's review of the shop drawings and submittal data shall not supersede these specifications, the accompanying drawings, or the contract terms, unless specifically covered by a properly executed change order, and then only to the extent specifically and explicitly stipulated therein.
- (3) Submit in accordance with requirements of Architectural Sections, Division 1.

B) Ductwork shop drawings shall be at a minimum 1/4" scale. Duct shop drawings shall show the following:

- a). All structural members larger than 4".
- b). All hydronic piping 2" or larger.
- c). All conduit 2" or larger
- d). All duct fittings, take-offs, volume dampers, control devices and fire dampers.
- e). All grilles, louvers, registers and diffusers.
- f). Duct dimensions and insulation methods.

- g). Duct dimensioned from structural beams and columns.
 - h). Architectural ceiling heights, furrings, chases, etc.
 - i). Cross-sections in areas of congestion or conflict.
 - j). Installation details for all duct and related equipment.
 - k). Lights, speakers, smoke detectors and other ceiling mounted devices.
 - l). All plumbing piping 2" and larger.
- C) All layout shop drawings shall be submitted in AutoCad and hardcopy. Layout drawings shall be dimensioned and coordinated with other trades.
- D) Coordination drawings shall include all items indicated above for the ductwork shop drawings and the following:
- a). All plumbing piping.
 - b). All structural members.
 - c). All electrical conduit.
 - d). All hydronic piping.
- E) No work shall begin until coordination and ductwork shop drawings are approved by Engineer.
- F) After completion of project Contractor shall turn over to the Architect complete operating and maintenance instructions including listing of supply and repair items and locations of places to purchase same. Comply with requirements of Division 1 Sections.
- G) Substitutions:
- (1) All material, equipment, methods, and accessories entering into the work under this section of contract are subject to approval or disapproval of the Owner. Approval of any manufacturer, material, or product shall not constitute a waiver of Owner's right to demand full compliance with contract requirements, including shape, size, quality and performance.
 - (2) Equality of materials is that established by opinion of Owner. Decision of Owner is final.
 - (3) Whenever a material or article of equipment is specified by use of a proprietary name, or by naming the manufacturer or vendor, any material or article which will perform adequately the duties imposed by the design will be considered for substitution, providing it is of equal substance, and function, meets specifications, and is aesthetically acceptable to the Owner. Refer to Division 1 Sections for approval procedures.
 - (4) Literature, technical data, etc., includes complete data and samples if necessary, with submissions for substitutions. Burden of proof that material offered for substitution is equal, or superior, in construction and efficiency to that named, rests on Contractor, and unless proof is satisfactory to Architect, substitution will not be approved. Contractor shall note any deviations from specified equipment with the substituted submittal. Failure to note deviations will result in rejection of substituted equipment and materials.
- H) See Architectural Specifications for "As-Built" requirements.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A) All equipment, ductwork, and materials shall be delivered to the Project Site clean and sealed for protection.
- B) Take particular care not to damage the existing construction in performing Work. All finished floors, step treads and finished surfaces shall be covered to prevent any damage by workers or their tools and equipment during the construction of the Project.
- C) Equipment and materials shall be protected from rust and dust/debris both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these Specifications.
- D) All material affected by weather shall be covered and protected to keep the material free from damage while material is being transported to the Site and while stored at the Project Site.
- E) During the execution of the Work, open ends of all piping and conduit, and all openings in equipment shall be closed when Work is not in progress, and shall be capped and sealed prior to completion of final connections, so as to prevent the entrance of foreign matter.
- F) All equipment shall be protected during the execution of the Work. All ductwork and equipment shall be sealed with heavy plastic and tape to prevent build-up of dust and debris.
- G) All ductwork and air handling equipment shall be wiped down with a damp cloth immediately before installation to ensure complete removal of accumulated dusts and foreign matter.
- H) All plumbing fixtures shall be protected and covered to prohibit usage. All drains shall be covered until placed in service to prevent the entrance of foreign matter.

1.9 JOB CONDITIONS

- A) Accompanying drawings, including plans, details, diagrams, notes, etc., are shown to limit and explain structural conditions, construction requirements, sizes, capacities and method of installation and erection. Structural and other conditions may require certain modifications and adjustments from conditions shown. Such deviations are permissible; however, specific sizes capacities and requirements affecting the satisfactory performance and operation of the installation shall remain unchanged. Make allowance for normal job conditions and interferences.
- B) Whenever it becomes necessary to shift ducts or pipes or to change shape of ducts, such changes shall be referred to Architect for approval.
- C) Ask for details whenever uncertain about method of installation. Lack of details not requested shall not excuse improper installation and correction shall be responsibility of Contractor. Contractor shall consult manufacturer for details specific to their items of equipment and include all piping, fittings, supports, controls, wiring, ductwork, valves, etc. required by the equipment manufacturer in their installation manuals.

- D) Furnish detailed duct layout and equipment room shop drawings based on field measurements and actual job conditions.
- E) Schedule and perform all mechanical work to avoid delays to the Contractor and other trades.
- F) All piping, cleanouts and covers, and other mechanical items in way of construction or remodeling, shall be rerouted, relocated or otherwise adjusted to work out with such construction or changes shown or specified in any or all of various sections of specifications. Unknown piping that is encountered will be referred immediately to Architect for method of disposition before continuation of work.
- G) The Contractor shall review the architectural drawings to become familiar with the phasing of construction required for this project.

1.10 GUARANTEE AND SERVICE

- A) Guarantee all equipment, materials, and workmanship for a period of one (1) year following date of acceptance unless noted otherwise. All HVAC compressors shall have a minimum 5-year parts and labor warranty. See 15800 for additional warranties related to HVAC equipment.
- B) During the period of guarantee any defects in equipment, materials, or workmanship shall be promptly corrected without cost to the Owner.
- C) Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment capacity specified shall be promptly corrected.
- D) Guarantee does not include maintenance items.

1.11 SUBSTANTIAL COMPLETION

- A) Substantial completion of HVAC, plumbing and fire protection work shall be determined by the Engineer. As a minimum the following work shall be complete for substantial completion:
- B) Test and balance is complete with all major deficiencies corrected.
- C) Building controls completed, tested and commissioned.
- D) All plumbing, fire protection and HVAC installed, operational and tested.
- E) Prior to a substantial completion engineer review, the Contractor shall submit in writing the status of all work, provide their internal punchlist, and certify that the work is substantially complete. The Engineer will then review the project for substantial completion. If the work is not substantially complete and the items required for substantial completion above are not completed, the Engineer will not recommend substantial completion. A preliminary punchlist will then be prepared. It shall be the Contractor's responsibility to prove substantial completion for a second review of the work.

PART 2 - PRODUCTS

2.1 GENERAL

- A) All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B) All equipment installed shall have local representation, local factory authorized service, and a local stock of repair parts.
- C) Responsibility for furnishing proper equipment and/or material and ensuring that equipment and/or material is installed as intended by the manufacturer, rests entirely upon the Contractor. Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.
- D) All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of Work involved. All Work shall be executed by mechanics skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job Site but shall be replaced with new materials and/or equipment.
- E) Materials and equipment manufactured domestically are preferred when possible. Materials and equipment that are not available from a domestic manufacturer may be by a non-domestic manufacturer provided they fully comply with Contract Documents.
- F) Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise, surfaces of ferrous metal shall be given a rust inhibiting coating.

2.2 ACCESS PANELS

- A) Provide all access panels necessary for proper access to valves, traps, fixture connections, dampers, VAV boxes, control devices or other items installed under this contract. Coordinate access with manufacturer's recommendations.
- B) Panels to be Milcor, Type M, or KARP Model D3C-214M hinged with screwdriver lock or as indicated on drawings for special locations, minimum size 12" x 12" or larger as required for proper access. Minimum size for VAV box access is 24" x 24"
- C) Exact locations for panels to be directed by Architect. Provide number of access panels required for proper access.

2.3 TOOLS AND SCAFFOLDING

- A) Furnish all tools, equipment, scaffolding and other facilities required to properly and expeditiously perform the work.

2.4 SIPHON PREVENTORS

- A) Furnish and install on all equipment and fixtures requiring same, backflow preventors or vacuum breakers of a type approved by the IPC and DHH. Water connections to fixtures and equipment shall be made in such a way as to prevent back siphonage when the water supply is out or the pressure drops. Provide reduced pressure type back flow preventors where

indicated on drawings. They shall be Watts series 900 or Febco Series 825, size as indicated on drawings.

2.5 SLEEVES AND THIMBLES

- A) Pipe sleeves - wrought iron or cast iron of sufficient size for piping and installation to be installed in floors, walls below grade, and grade beams where piping passes through.
- B) Thimbles above grade - heavy galvanized steel of proper size to allow freedom of piping and insulation, set in floor or roof slab as work progresses, also to be installed in wall and partitions where piping passes through.
- C) Thimbles below grade - same as pipe sleeves above.
- D) Sleeves through floors extend 1" above finished floor. Caulk around and seal all piping in chases and piping passing through floor slab.
- E) Provide sleeve seals and shields for all pipe penetrations of ground floor slab.
- F) Provide UL listed fire-stopping in all pipe penetrations of rated floors and walls, see Architectural Specifications for Requirements.
- G) Provide escutcheons for all exposed piping penetrating walls, ceilings or floors.

2.6 BUCKS, GROUNDS AND CHASES

- A) Be responsible for proper location and sizes or for any errors or omission in placing same.
- B) Failure to inform the General Contractor promptly of such requirements shall not relieve the Mechanical installer of the responsibility for providing a complete mechanical system.

2.7 HANGERS

- A) Horizontal piping above grade without hubs shall be rigidly supported. Distance between pipe supports:

(1) 1/2" pipe	6'-0" maximum
(2) 3/4" pipe	7'-0" maximum
(3) 1" pipe	8'-0" maximum
(4) 1 1/4" pipe	9'-0" maximum
(5) 1 1/2" pipe and over	10'-0" maximum
- B) Hangers shall be similar to "Split Ring" type.
- C) Metal strap or wire will not be acceptable.
- D) For two or more systems of piping run parallel and with same grade trapeze hangers may be used.

- E) Use #22 gauge galvanized sheet steel saddles, minimum 18" long between the pipe covering and each pipe hanger on all insulated lines. Saddles shall extend along pipe runs and at least half way up piping on each side.
- F) All above grade horizontal sewer drain, vent, waste and similar piping shall be hung at every hub using the same type hangers as specified for other piping.
- G) Rods supporting pipe hangers shall have the following dimensions:

½" to 2" pipe	3/8" rod
2-1/2" to 3" pipe	½" rod
4" to 5" pipe	5/8" rod
6" pipe	¾" rod
8" through 12	7/8" rod

Rods for trapeze hangers shall be a minimum of 3/8" and shall have the equivalent cross section, listed above, per pipe supported.

2.8 PAINTING AND IDENTIFICATION

- A) Equipment, including pumps, motors, and similar factory fabricated and assembled units shall be furnished with factory applied protective prime coat paint of finished baked enamel. Equipment surfaces damaged during course of construction or shipment shall be refinished by the Mechanical Contractor.
- B) Uncoated black ferrous piping and fittings shall be cleaned under this section and painted with one coat of enamel paint under PAINTING SECTION. Color of piping shall be as follows:

(1) Piping Supports – Safety Yellow

Hangers and supports shall be coated by dipping or brush painting with one coat of asphalt varnish. Steel frame equipment supports shall be cleaned and painted with one coat of aluminum paint. Natural gas piping shall be painted safety yellow per Painting Section for metal piping. Exposed sprinkler piping shall be painted safety red per Painting Section for metal piping.

- C) Detached motor controllers, disconnects, etc., shall be identified with metal or plastic plates with etched letters to completely identify service of electrical equipment.
- D) Major control and sectionalizing valves shall be identified by means of etched brass plates bracketed to valve handle. Contractor shall prepare schedule of such identifying plates for Architect's approval.
- E) Exposed ductwork shall be cleaned under this Section and painted under Painting Section.
- F) Provide ceiling markers for all controllers, valves, fans or VAV boxes located above the ceiling. The ceiling markers shall be ½" diameter dots colored to represent the system for valves. Provide equipment labels with ½" high black lettered text for all controllers, VAV boxes and fans.
- G) Duct systems shall be labeled with printed plastic contact-type permanent adhesive labels.

H) All domestic water piping shall be labelled. The label shall designate the piping system and direction of flow. The piping shall have a color marker applied every 5' to indicate service as follows:

(1) Domestic Cold Water – Safety Green

(2) Domestic Hot Water – Green Byte

2.9 NAMEPLATES

A) Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.

B) Nameplates shall be black laminated rigid phenolic with white core. Nameplate minimum size shall be 1 inch high by 3 inches long with 3/16-inch-high engraved white letters.

C) Nameplate Fasteners: Fasten nameplates to the front of equipment only by means of stainless steel self-tapping screws. Stick-ons or adhesives will not be allowed unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.

D) Nameplate Information: In general, the following information is to be provided for the types of electrical components or enclosures supplied with equipment.

E) Individual Starters, Contactors, Disconnect Switches, and Similar Equipment: Identify the device, and voltage characteristics source and load served.

2.10 WALL, FLOOR AND CEILING PLATES (ESCUTCHEONS)

A) Except as otherwise noted, provide stainless steel or chrome plated brass floor and ceiling plates around all pipes, ducts, conduits, etc., passing exposed through walls, floors or ceilings, in any spaces except underfloor and plenum spaces.

B) Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation.

C) For finished ceiling installation, secure escutcheons to ceiling with escutcheon fasteners.

D) Plates will not be required for piping where pipe sleeves extend 3/4-inch or more above finished floor.

E) Round and rectangular ducts shall have closure plates (not chrome plated) made to fit accurately at all floor, wall and ceiling penetrations.

2.11 MOTOR CONTROLLERS AND ELECTRIC INTERLOCKS

A) Except where otherwise specified or as included as an integral part of the normal and customary mechanical equipment, each starter shall be furnished by other divisions complete with the required control power transformers and auxiliary contacts necessary for control interlocks and wired by a licensed electrician in accordance to governing codes.

- B) In fractional horsepower 120v-single phase roof or wall mounted fans, a motor rated manual starter/disconnect with on-off snap switch type with soldered ratchet overload protection shall be furnished by the Contractor furnishing the fans and wired by a licensed electrician in accordance to governing codes.
- C) When interlocking of equipment is required all wiring in excess of fifty (50) volts to be provided by a licensed master electrician and coordinated by the Contractor. All other wiring fifty (50) volts or less or as required by the controls/energy management system shall be fully coordinated by the Contractor to provide and assure a complete and fully operational system. Provide all conduit for controls and or power wiring in accordance with Division 16 requirements, and installed by licensed electrician and coordinated by the Contractor.
- D) Except for such items that are normally wired up to their point of manufacture and so delivered and unless specifically noted to the contrary herein, the Contractor shall do all electric wiring of every character for interlocking, pilot, and control in accordance with methods and materials described within Division 16 of these Specifications. This includes conduits and mounting of all electrical devices.
- E) Furnishing of complete wiring diagrams showing proper control and interlock wiring shall be work under the trade supplying the equipment. Diagrams shall be based on the approved equipment for this project and shall be complete integral drawings, not a series of manufacturers' individual diagrams.
- F) The electrical design and Drawings are based on the equipment scheduled and shown on the Mechanical Drawings and should any mechanical equipment requiring changes to the electrical design be approved, the required electrical changes shall be made at no cost to the Owner.

2.12 CONTROL POWER AND EQUIPMENT POWER FOR CONTROLS

- A) Control power, whether it be DDC, 24 volt, or 120 volt, should be delivered to each piece of mechanical equipment, fire/smoke dampers, and/or control panels whether or not it is specifically indicated on the Contract Drawings.
- B) It is the Contractor's responsibility to include in his or her bid all costs in connection with control wiring, and/or power, whether or not it is specifically indicated. Regardless of how large in nature or how incidental, no additional compensation will be approved by the Owner's representative or Design Professionals concerning a failure on the Contractor's part to include these costs in bid proposal or a failure on the Contractor's part to properly coordinate these important functions.
- C) Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and all national, state, and local electrical codes. Insulated wire should use copper conductors and shall be UL Listed for 200°F minimum service.
- D) All control wiring in mechanical, electrical, telephone rooms or exposed to be installed in raceways. All other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit). All conduit outdoors shall be EMT with rain tight fittings. Line voltage control wiring shall be run in EMT.

2.13 SAFETY GUARDS

- A) Provide safety guards for moving equipment such as fan belt drives and motor drive couplings.
- B) Use OSHA approved belt guards and couplings guards. Provide 1/2 inch hole in guard at center of shaft of driven equipment where belt type drives are used.

2.14 LIFE SAFETY FIRE SMOKE DAMPERS

- A) It is the Contractor's responsibility to coordinate with the Drawings provide fire and or fire smoke dampers as indicated.
- B) It is the Contractor's responsibility to coordinate with other applicable trades to determine the proper voltage of the fire/smoke damper operator and the proper sequencing of the damper operation.

PART 3 - EXECUTION

3.1 PREPARATION

- A) Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.
- B) The size of equipment indicated on the Drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine that the equipment proposed will fit in the space. Fabrication Drawings shall be prepared when required by the Architect/Engineer or Owner to indicate a suitable arrangement.
- C) All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- D) Space Requirements:
 - (1) Consider space limitations imposed by contiguous Work in location of equipment and material. Do not provide equipment or material which is not suitable in this respect.
 - (2) Make changes in material and equipment locations of up to five (5) feet, to allow for field conditions prior to actual installation, and as directed by the Architect/Engineer at no additional cost to the Owner.
- E) Contractor shall note that the electrical design and Drawings are based on the equipment scheduled and indicated on the Drawings. Should any equipment be provided requiring changes to the electrical design, the required electrical changes shall be made at no cost to the Owner.
- F) Connections for equipment other than Divisions 15,16:

- (1) Rough-in and provide all gas, air, water, steam, sewer, etc. connections to all fixtures, equipment, machinery, etc., furnished by the Owner and/or other trades in accordance with detailed rough-in Drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.
- (2) After the equipment is set in place, make all final connections and provide all required pipe, fittings, valves, traps, etc.
- (3) Provide all backflow preventers and air gap fittings required, using approved devices. In each service line connected to an item of equipment or piece of machinery, provide a shutoff valve. On each drain not provided with a trap, provide a suitable trap.
- (4) Provide all ductwork, transition pieces, etc., required for a complete installation of vent hoods, fume hoods, etc.

3.2 INSTALLATION

- A) Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B) All installation shall be in accordance with manufacturer's published recommendations.
- C) Piping may be run exposed in rooms typically without ceilings such as mechanical rooms, janitor's closets, tight against pan soffits in exposed "tee" structures, or storage spaces, but only where necessary. Shutoff and isolation valves shall be easily accessible.
- D) All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that piping shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.
- E) Prior to the installation of any ceiling material, gypsum, plaster or acoustical board, the Contractor shall notify Owner's Project Manager so that arrangement can be made for an inspection of the above-ceiling area about to be "sealed" off. The Contractor shall provide written notification to the Owner at least five (5) calendar days prior to the inspection.
- F) Precedence of Materials:
 - (1) The Specifications determine the nature and setting of materials and equipment. The Drawings establish quantities, dimensions and details.
 - (2) If interference is encountered, the following installation precedence of materials shall guide the Contractor to determine which trade shall be given the "Right of Way":
 - a). Building lines
 - b). Structural members
 - c). Structural support frames supporting ceiling equipment
 - d). Soil and drain piping
 - e). Vent piping

- f). Supply, return and outside air ductwork
- g). Exhaust ductwork
- h). HVAC water and steam piping
- i). Condensate piping
- j). Fire protection piping
- k). Natural gas piping
- l). Medical/Laboratory gases
- m). Domestic water (cold and hot, softened, treated)
- n). Refrigerant piping
- o). Electrical conduit

3.3 EXCAVATION, TRENCHING AND BACKFILL

- A) The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings. During excavation material suitable for backfill shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All material not suitable for backfilling shall be removed completely from job site. Such shoring shall be done as hereinafter specified.
- B) Trenches shall be of necessary width for the proper laying of the pipe and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support. Bottom of trenches shall have 6" layer of compacted limestone aggregate. Care shall be taken to provide uniform bearing and support.
- C) Bell holes and depressions for joints shall be dug after compaction and grading in order that the pipe will be supported along its entire length. Whenever wet or otherwise unstable soil that is incapable of receiving the bottom preparation and support piping, as determined by the Engineer, is encountered, such soil shall be removed to the depth required and the trench backfilled to the proper grade with river sand.
- D) All shoring required to perform and protect the excavation, and as required for the safety of employees, shall be installed. The sides of the trenches, four (4') feet or less shall be protected as required. For trenches more than four (4') feet in depth, the sides shall be secured by the use of continuous sheet piling and shall be not less than two (2") inches in thickness. Meet the minimum requirements of OSHA for trench shoring not described above.
- E) The trenches shall not be backfilled until all required pressure tests are performed and until the certificates of inspection from the proper authorities are obtained by the Contractor. The trenches shall be carefully backfilled with the excavated materials approved for backfilling consisting of earth, loam, sandy clay, sand and gravel, or other approved materials free from large clods of earth or stone, deposited in six (6") inch layers and thoroughly and carefully rammed until the pipe has a cover of not less than two (2') feet. The remainder of the backfill material shall then be thrown into the trench in one (1') foot layers and tamped. Any trench improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted, with the surface restored to the required grade and compaction, mounded over, and smoothed off. Sidewalks, drives and streets broken up by this work shall be repaired and returned to original condition.

3.4 FLASHING AND COUNTERFLASHING

- A) All pipes and ducts that pass through roof and walls shall run so as not to interfere with the structural system and to permit proper application of base and counterflashing. All plumbing vents are to be finished with 2-1/2 pound sheet lead turned down into pipe. Other pipes to be provided with suitable curbs and flashed to roof or walls as indicated. Flues shall be properly flashed and counterflashed with approved type jacks. Roof drains shall have 2-1/2 pound lead sheet base secured to drain clamp and extending minimum of 2'-0" in all directions.

3.5 CLEANING, STERILIZING AND PIPING

- A) When all work has been finally tested, Contractor shall clean all fixtures, pipes and exposed work.
- B) All pipes shall be free from all obstructions.
- C) All plated and other finished products shall be thoroughly cleaned and polished.
- D) New water piping shall be sterilized as required by State Sanitary Code. Provide detailed reports describing sterilization method and duration for each piping section.
- E) All piping shall be installed so that it may expand and contract freely without damages to equipment, other work, or injury to piping system. All necessary swing joints, expansion joints, or offsets to protect piping, etc., shall be installed whether indicated or not. Piping shall be graded to allow for system drainage.
- F) Stainless steel or chromium plated floor, wall and ceiling plates shall be furnished on all exposed piping passing through floor, walls, or ceilings. Plates shall be secured in place with round head screws or toggle bolts of proper size and type for adjacent construction.
- G) All piping shall be installed and sized as indicated on plans and be of equivalent materials to piping as hereinafter specified.
- H) All piping shall be installed with runs arranged parallels or perpendicular to walls and ceilings with symmetrical and equal spacing between parallel pipes. Offsets shall be made using factory fittings, bending of piping shall not be accepted.
- I) Notify Engineer a minimum 72 hours prior to enclosing piping in concealed spaces so that piping may be inspected.

3.6 TESTING

- A) When any piece of mechanical equipment is operable and it is to the advantage of the Contractor to operate the equipment, Contractor may do so, provided that Contractor properly supervises the operation, and has the Owner's written permission to do so. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner, or date of Substantial Completion, whichever occurs first.
- B) Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and performance certification will be the same date.

- C) Before the Work is accepted, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of manufacturer's materials and/or equipment to determine that materials and/or equipment are properly installed and in proper operating order. The qualifications of the manufacturer's representative shall be appropriate to the technical requirements of the installation. The qualifications of the manufacturer's representative shall be submitted to the Owner for approval. The decision of the Owner concerning the appropriateness of the manufacturer's representative shall be final. Testing and checking shall be accomplished during the course of the Work where required by Work being concealed, and at the completion of the Work. In addition, the Contractor shall submit to the Architect/Engineer a signed statement from each manufacturer's representative certifying as follows: "I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations."
- D) Check inspections shall include piping, equipment, heating, air conditioning, insulation, ventilating equipment, controls, mechanical equipment and such other items hereinafter specified or specifically designated by the Architect/Engineer.
- E) The Contractor shall execute, at no additional cost to the Owner, any tests required by the Owner or the National Fire Protection Association, ASTM, etc. Standards listed. The Contractor shall provide all equipment, materials and labor for making such tests. The Owner will pay reasonable amounts of fuel and electrical energy costs for system tests. Fuel and electrical energy costs for system adjustment and tests, which follow Substantial Completion by the Owner, will be borne by the Owner.
- F) Notify the Owner's Project Manager and the Architect/Engineer in writing at least seven (7) calendar days prior to each test and prior to other Specification requirements requiring Owner and Architect/Engineer to observe and/or approve tests.
- G) All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel performing, observing and inspecting, description of the test and extent of system tested, test conditions, test results, specified results and other pertinent data. Data shall be delivered to the Architect/Engineer as specified under "Requirements for Final Acceptance." The Contractor or Contractor's authorized job superintendent shall legibly sign all Test Log entries.
- H) Refer to Commissioning Specification Sections for additional Start-up, prefunctional and operational checkout, and for functional performance test procedures.

3.7 TESTING AND INSTRUCTION

- A) Piping shall be tested to pressure hereinafter specified. Where pressures are not mentioned, it shall be understood that testing to 1-1/2 times service conditions, before insulation is applied, will be acceptable. All tests shall be held for a minimum of 24 hours before inspection. Test pressures shall not exceed the rated working pressure of any system component.
- B) Furnish all necessary gauges, pumps, test plugs, and temporary connections and shall test sections of the building as work progresses.

- C) All new underground sewerage, waste and storm drainage piping shall be plugged at outlets and tested hydrostatically to 10 psi before being covered. Notify Engineer a minimum 72 hours prior to any backfill of underground piping so that piping may be inspected. Failure to notify Engineer prior to backfill will constitute a rejection of the underground piping installation. All other drainage piping, vent and waste risers shall be plugged and tested by filling with water from top to bottom of each floor prior to being connected to fixtures. Tests shall be held a minimum of 24 hours.
- D) All new cold and hot water supply piping shall be tested hydrostatically to 125 pounds per square inch before application of insulation. Test shall be held a minimum of 24 hours.
- E) All tests shall be made in the presence of the Architect or his representative. Where pipes or connections in new piping are found to leak, they shall be made tight and the tests repeated.
- F) Make all necessary adjustments to controls, dampers, valves, etc., to obtain best operation first with empty building and later under actual conditions. A minimum of two job site visits required.
- G) Thoroughly check the operation of each item of equipment and controls while testing, without waiting first for the Owner or Architect to complain about their operation. Verify that same are wired correctly and completely, notifying the proper parties for necessary corrections. Thoroughly instruct the Owner's representative in the operation and care of controls, individual equipment, and entire system. Provide training for each equipment item to include recommended maintenance procedures, control adjustments and system installation specifics. The following is the minimum training period for each item of equipment:
 - (1) Overall Plumbing System – 2 hours
 - (2) Overall HVAC System – 8 hours
- H) Coordinate with owner provided test and balance Contractor. Provide necessary belts, sheaves, insulation repairs, gauge ports, etc. as required for Owner testing. Mechanical Contractor shall be complete all work 2 weeks prior to substantial completion so that test and balance can be performed prior to substantial completion.
- I) After adjustment period and before acceptance replace construction filters specified in 3.8 with specified type.

3.8 CUTTING AND PATCHING

- A) Cooperate to the fullest extent with all other trades to reduce to a minimum the amount of cutting and patching of other work necessary for this installation. Do not cut or patch the work of other trades but arrange to provide cutting templates in time, or otherwise pay the respective other contractors for changing theirs, to accommodate this work. No cutting into any structural units likely to impair the strength shall be done without the approval of the Architect.

3.9 CLEAN UP

- A) Remove debris, surplus and waste materials, oil, grease or stains resulting from the work performed and leave the premises in a broom clean condition AT THE END OF EACH

WORKING DAY. All debris, surplus and waste material shall be removed completely from the job site.

3.10 OPERATION OF AIR-HANDLING UNITS DURING CONSTRUCTION

- A) Contractor shall provide 4”-85% efficient filters for units with 1.0” ESP and greater or (sets of 2) MERV 12, 1” filters for units under 1.0” ESP for air-units operated during construction. In addition roll type filter media shall be provided on all return air grilles and unit openings. Contractor shall be responsible for changing media as required. The Contractor is to protect the air unit coils and keep air-unit and duct interior surfaces clean. All ductwork and air unit/fan openings shall be covered with plastic wrap during construction. If the Contractor fails to comply with the filtration requirements, the Contractor shall clean and/or replace the coils and duct system at his expense.

3.11 INSTALLATION OF VRF/VRV HEAT PUMP SYSTEMS

- A) **All VRF/VRV heat pump systems shall be installed in strict accordance with manufacturer’s installation requirements. All contractor employees working on heat pump systems shall be trained by the heat pump system manufacturer in the operation, maintenance and installation of the system. Contractor shall provide evidence of training prior to the start of heat pump installation work. Only trained workers shall be allowed to install heat pump system components, including refrigerant piping, controls, indoor units, outdoor units and branch boxes. If heat pump system items are installed by workers that do not have the proper training, all work by the untrained employees shall be removed and reinstall by trained employees at the Contractor’s expense.**

3.12 WELDING

- A) Codes and Standards

- (1) American Society of Mechanical Engineers (ASME) B31.1
- (2) ASME Boiler and Pressure Vessel Code – Section V and IX
- (3) American Welding Society (AWS) D10

- B) Qualifications for Welding Work: The fabricator and/or installer shall qualify each welder or welding operator for the welding processes to be used during production and field welding. The performance qualification shall be in accordance with a qualified Welding Procedure Specification (WPS). The WPS shall be governed by the essential variables listed in ASME Section IX and AWS D10.9 as may be applicable for the welding processes for which the welder is being qualified. Provide certification that the welders performing work on this project are qualified in accordance with the WPS, as well as the parameters used in the qualification.

- C) Welds shall be in accordance with ASME and AWS standards as qualified under ASME Section IX. Owner shall employ a testing agency to perform a visual inspection of 5% of the welds in accordance with ASME Section V. The following visual examination indications shall be deemed unacceptable and shall be corrected at Contractor’s expense:

- (1) Cracks on external surfaces
- (2) Surface undercut greater than 1/32 inch deep.

- (3) Weld reinforcement greater than specified in ASME Table 127.4.2
- (4) Lack of fusion on surface
- (5) Incomplete penetration

Future inspections for failed welds shall be tested at Contractor's expense.

END OF SECTION

PIPING AND EQUIPMENT INSULATION

SECTION 15250

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a complete system of insulation, as herein specified, for both inside and outside of building.
- B. The General Provisions of the Contract including General and Supplementary Conditions and General Requirements apply to the work specified in this Section.
- C. Refer to Section BASIC MATERIALS AND METHODS, which is applicable to this Section.
- D. Insulation shall include insulating materials, their applications, finish, bands, tie wire and weather protection for all piping, fittings, valves, and equipment as indicated and specified herein.

1.2 GENERAL

- A. All insulation shall be applied in a workmanlike manner by skilled workmen regularly engaged in this type of work.
- B. All pipe insulation shall have COMPOSITE flame and smoke hazard ratings as tested in accordance with standard testing methods (NFPA) 255 and UL 723).
- C. Composite ratings shall not exceed: flame spread 25, smoke developed 50.
- D. Accessories such as adhesive, mastic, cement, tapes and cloths shall have the same component ratings as listed above.
- E. THE INSULATION CONTRACTOR SHALL CERTIFY IN WRITING, PRIOR TO INSTALLATION, THAT ALL PRODUCTS TO BE USED WILL MEET THE ABOVE CRITERIA.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING ABOVE GROUND

- A. Insulate all new above ground hot & cold water pipe with closed cell foam pipe insulation with factory applied white all service jacket, with self-sealing lap (ASJ-SSL).
- B. Insulate fittings, flanges and valves with performed insulation with PVC premolded one-piece fitting covers, with closed cell foam inserts. Premolded or shop fabricated Glass Fiber covers may be used in lieu of above at the Contractor's option. Optional covers to be given a

smoothing coat of finishing cement in exposed areas and vapor sealed in all areas with vapor barrier mastic coating reinforced with white glass fabric.

- C. Insulation thickness for all cold water piping to be ½ inch.
- D. All new domestic hot water and hot water circulating piping shall be insulated in accordance with the Schedule below.

	PIPE DIAMETER	INSULATION THICKNESS
All mains, branches and other piping	1-1/4" and less 1-1/2" to 4"	1/2" 1"

- E. Provide an isolating vapor seal between pipe insulation jacket and pipe at butt joints of insulation at fittings, flanges, valves, hangers and at 21 foot intervals on continuous runs.
- F. Adhere longitudinal laps and butt strips of jacket with factory applied pressure sensitive tape system.

2.2 DUCT INSULATION

- A. DUCT SIZES SHOWN ON DRAWINGS ARE FREE AREA SIZES. See Section 233000 for insulation and duct material and type required for each application. Insulation shall be as per the following:
- C. Lined Duct system - All lined ducts shall be lined with Knauf Duct Liner E-M, Manville Lina-Coustic ductliner, or approved equal. Duct Lining shall be applied in strict accordance with the latest edition of SMACNA's "HVAC Duct Construction Standard Metal & Flexible." Mechanical fasteners shall meet "Standards for Mechanical Fasteners MF-1-1975." Length of mechanical fasteners shall not compress the insulation more than 1/8" and shall be installed perpendicular to the duct surface. Adhesive shall conform to ASTM C 916 and be applied to the sheet metal with a 90% minimum coverage. All exposed edges of the duct liner material shall be coated with the same adhesive. All rips and tears shall also be repaired using adhesive. All internal duct areas shall be covered with duct liner. Transverse joints shall be firmly butted with no gaps, and coated with adhesive. Longitudinal corner joints shall be overlapped and compressed. For velocities from 4001 to 6000 FPM, metal nosing shall be applied to all upstream transverse edges to additionally secure the insulation." Liner shall be 1" thick, 1.5 PCF.

Exterior Duct Wrap - Exterior insulation duct wrap shall be 2" thick .75 PCF fiberglass wrap with F.S.K. jacket, KNAUF duct wrap, or approved equal.

2.3 AIR CONDITIONING DRAINS AND REFRIGERANT PIPING

- A. Insulate all air conditioning condensate drains and all refrigerant pipe, fittings, flanges and valves with flexible foamed plastic tubing insulation, J-M Aerotube 11, Rubatex, or approved equal. Thickness to be 3/4 inch. Seal all seams and joints with adhesive. Exterior refrigerant piping shall be covered with 20 mil grey PVC jacket.

- B. Insulate all horizontal waste piping (new or existing) above ground that receives A/C condensate from drain to vertical stack. Also insulate the "P" trap of those drains. Insulation shall be closed cell foam for piping, fitting flanges and valves except thickness shall be 1/2 inch for all pipe sizes.

2.4 ROOF DRAINS

Insulate the body of all roof drains and the roof drain piping and fittings from the drain through all horizontal runs to the connection with the vertical leader with flexible foamed plastic tubing insulation, J-M Aerotube 11, Rubatex, or approved equal. Thickness to be 1/2 inch for all pipe sizes. All joints shall be sealed per manufacturer's recommendations.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND INSTALLATION

- A. All insulation shall be applied per manufacturer's specifications and installation requirements.
- B. Insulation shall be applied over clean dry surfaces after all test have been performed and approved.
- C. Methods of application and other details not specified herein shall be in accordance with manufacturer's recommendations, which shall constitute minimum standards.
- D. Sheet Metal Saddles - 10" long shall be provided on all hangers supporting insulated lines. They shall be fabricated to conform with the outside diameter of the pipe covering and shall be fabricated from 22 gauge sheet iron for pipe through 2-1/2" 20 gauge sheet iron for pipes through 8" and 16 gauge for all pipes over 8".
- E. A rigid insulation material shall be used at each pipe hanger as an insert and the pipe covering shall pass full thickness through the hangers.
- F. On all outdoor piping insulation above ground (including covered parking area), provide aluminum jacket 0.016 inch thick with longitudinal z-joint secured with preformed 2" wide butt strips, as manufactured by KNAUF, MANVILLE or approved equal. Provide preformed aluminum fitting cover on all fittings.

END OF SECTION

PLUMBING

SECTION 15400

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this Section.

1.2 DESCRIPTION OF WORK

- A. Furnish and install new fixtures, waste, vent, cold water and hot water piping shown on plans.
- B. Connections of all equipment and fixtures with accessory fittings, shut-off valves, trimmings, traps, structural supports, insulation, etc., as herein specified and/or as shown on drawings.
- C. Refer to SECTION 15050 which is applicable to this Section.
- D. Include (but not necessarily limited to) the following items of mechanical equipment, fixtures and materials installed and in a first class operating condition:
 - 1. All labor, materials, equipment, accessories, and miscellaneous items required to provide a complete plumbing system. Provide adequate supervision at all times during the progress of the work.
 - 2. All plumbing piping and hangers for same as specified herein and where shown on the Architectural and/or mechanical drawings.
 - 3. All sewer, waste and vent piping and all cleanouts necessary for a complete operation installation as shown on mechanical drawings, or as required by the State and Local Sanitary Codes.
 - 4. Temporary water, sanitary, etc., facilities during construction period.
 - 5. Gas meter and piping.
 - 6. Domestic booster system.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide plumbing fixtures and accessories for work in this Section produced, meeting the requirements specified.
- B. Soldering processes shall conform to ASME B31.3 Process Piping and Copper Development Association recommended practices.

PART 2 - PRODUCTS

2.1 SANITARY SEWER

- A. All soil, waste and vent piping shall be solid core, pressure rated schedule 40 PVC with solvent weld fittings. Pipe and fittings shall conform with ASTM D 2665.

- B. Cleanouts in sanitary lines, both inside and outside at building, cast-iron body caulking ferrules with brass thread flanged plugs.
- C. Cleanout covers located in floors for sewer lines inside of building, with satin brass scoriated tops and covers.
- D. Cleanouts shall be installed in each change of direction of sewer lines where more than a 45 degree angle turn is made. Cleanouts shall be provided within 18" of each sanitary tee.
- E. Cleanouts on underground lines shall be brought to a cast-iron cleanout box, with service marking, 1/2" thick flanged type and loose cover. Provide 12" X 4" thick concrete slab around cover and frame.
- F. Size and distance between cleanouts shall be required by local authorities and/or as indicated on drawings.
- G. All floor drains shall be provided with trap primers and ½" trap primer line.

2.2 DOMESTIC WATER

- A. Ball valves shall be provided where indicated on drawings and shall be designed for a minimum water working pressure of not less than one hundred fifty (150) pounds per square inch. Each underground valve shall be protected by a cast-iron valve box with minimum thickness of 3/16 inch. The cover shall have the word "WATER" cast in the metal.
- B. Hot and cold water piping inside the building shall be hard drawn seamless copper tubing, type "L", with wrought copper sweat fittings and lead free solder above grade. No joints shall be allowed under building slab, on piping 1" and smaller, larger pipe sizes shall have joints with lead free solder. Water piping underground shall be Type "K". Piping on exterior of building shall be Type "K".
- C. All piping, fittings, solder and flux used in conjunction with the potable water systems shall be lead free. The term "lead free" shall be as defined in the Safe Drinking Water Act Amendment of 1986 (P.L. 99-339).

2.3 GAS PIPING

All gas piping above ground shall be Schedule 40 black steel. Above ground piping system shall be threaded pipe and fittings using malleable iron fitting for pipe sizes 1-1/2" or less. Interior piping 2" and larger shall be welded. The above ground system shall meet the requirements of ASTM A53. Underground gas piping shall be heat fusion joined medium density polyethylene, SDR 13.5 yellow color installed with metallic tracer tape. Gas pipe shall be manufactured in accordance with ASTM D2513 with the resin having a D3350 cell classification of 234343E, Grade PE24. Piping shall be installed in accordance with manufacturer's recommendations. Provide anodeless risers at all transitions from underground polyethylene piping to above ground steel piping.

2.4 FIXTURES

- A. Furnish, install and/or connect all plumbing fixtures indicated on drawings or as herein specified. Refer to Mechanical as well as Architectural Drawings for location and number of fixtures required. If any fixtures shown on Architectural Plans but not on Mechanical Plans, or vice versa, these fixtures shall be furnished, installed and connected the same as if indicated on all drawings. See Architectural Drawings for specific fixtures required. Where a specific manufacturer's name and catalog number is used to indicate the type and quality required, it shall be assumed that other manufacturer's products may be used, where they are equal and approved by the Architect as stipulated elsewhere herein.
- B. Each plumbing fixture shall be fitted with all necessary and proper fittings, trim and operating devices and shall be left in perfect operating condition. The finish of all traps, wall escutcheons, and exposed metal work in connection with fixtures, trimmings and operating devices shall be chromium plated.
- C. Before setting any fixtures or rough-in for fixtures, obtain the exact mounting height, as desired, from the Architect.
- D. Equipment shown on drawings to be furnished under other sections shall be roughed-in, installed and connected by this Contractor under this Section. This Contractor shall furnish and install all necessary valves, piping, fittings and waste traps, etc., not provided with said equipment but as required for proper operation and installation. Obtain rough-in dimensions before installing any piping.
- E. See plans for fixture schedule.

2.5 VALVES, STRAINERS, UNIONS AND FITTINGS

- A. General - All material shall be new, of the best quality with same brand or manufacturer for all similar installations. SEE SECTION 15900 for type and manufacturer.

2.5 WATER HAMMER ARRESTORS

- A. Provide arrestors as marked A.C. (air chambers) where shown on the drawings and/or as necessary to prevent water hammer in the piping based on actual piping arrangement on the job. At a minimum water hammer arrestors shall be provided at each fixture group. Branch lines over 20' shall be provided with 2 water hammer arrestors. Size and install water hammer arrestors as per manufacturer's recommendations for the installed plumbing fixture units on each branch.
- B. Install fluid water hammer arrestors in compliance with ASSE Standard 1010.
- C. Each unit shall be constructed with a single moving part. The barrel shall be fabricated of Type "K" hard drawn copper, with the cap fabricated from standard wrought copper fittings attached to the barrel with lead free solder. The piston shall be machined from brass and equipped with rubber "O" rings.

2.6 CONNECTIONS

- A. Provide flexible pipe connections and expansion joints suitable to connect to

adjoining piping for pipe joints.

- B. Use pipe sized units.
- C. Provide connectors compatible with operating temperatures and pressures at installation point.

FLEXIBLE CONNECTORS

- A. Bronze inner hose and braided exterior sleeve.
- B. Between Equipment and Piping 2 In. and Smaller: Steel or bronze end fittings, screwed, with NPT threads.
- C. Between Equipment and Piping 2-1/2 In. and Larger: Plate steel flanged end fittings, 150 lb. Drilled for bolting to piping flanges.
- D. Use connectors suitable for minimum 125 psi WSP and 450°F.
- E. Acceptable Manufacturers:
 - 1. Hyspan.
 - 2. Metraflex.
 - 3. Advanced Thermal Systems.
 - 4. Anaconda Metal Hose.
 - 5. Flexonics Division.
 - 6. U.S. Flexible Metallic Tubing.

EXPANSION JOINTS

- A. Steel Piping: Stainless steel bellows type with anti-torque device, limit stops, and internal guide.
- B. Copper Piping: All bronze type with 2-ply bronze bellows, anti-torque device limit stops, internal guides and solder joint end.
- C. Copper or Steel Piping 2 In. and Under: Low pressure compensators with 2-ply bronze bellows suitable for minimum 75 psi pressure and 250°F and maximum 1/2 in. expansion.
- D. Acceptable Manufacturers:
 - 1. Anaconda.
 - 2. Flexonics Division.
 - 3. Metraflex Co.

2.7 DOMESTIC WATER BOOSTER SYSTEM

Furnish and install a **Model DS-70-50-2VS** Duplex variable speed, variable flow factory assembled water booster system as manufactured by Canariis Corporation, Riverview, Florida or equal. The unit shall be rated for a system capacity of 70 GPM, with a system pressure of 60 PSIG, including a minimum suction pressure of 10 PSIG.

The complete Packaged Pumping System, including pumps, motors, control equipment, variable frequency drives, tank, valves, fittings and manifolds must be UL Listed under Category QCZJ (Packaged Pumping Systems). In addition to the UL Listing for the complete system the control panel assembly must be separately listed under UL 508A (Industrial Control Panels). All welding shall be performed by certified welders in accordance with ASME section IX.

FACTORY ASSEMBLY

The booster system shall be factory assembled on a steel skid including pumps, motors, valves, 3" SCH10 300 series stainless steel suction and discharge manifolds, and all interconnecting piping, wiring and controls. Manifold connections will be flanged at one end. Branch piping and tank piping (if applicable) shall be the same material as the suction and discharge manifolds. Provide isolation valves on the suction and discharge of each pump. The valves shall be full-port ball valves or lug style butterfly valves. Provide a thermal purge valve on the discharge of each pump. Provide two 4 1/2" ASME grade A, panel mounted gauges for indicating system suction and system discharge pressure. All skid mounted components shall be factory finished in a high quality enamel paint. Individual pumps, motors and pressure regulating or check valves may be serviced with the booster system in operation and all components shall be suitable for the maximum working pressure and temperature in the system.

PUMPS

System shall include two vertically mounted close-coupled end suction centrifugal pumps with ANSI flanged connections. Pump features to include foot supported casing, back pull out design, top centerline discharge and hydraulically balanced impeller. Pump shall be cast iron bronze fitted construction with a replaceable shaft sleeve and mechanical seal suitable for a working pressure of 175 PSIG. Motor shall be NEMA close-coupled type with a JM shaft.

Pump No. 1 and Pump No. 2 shall be rated 60 GPM at 115 ft head.

MOTORS

Motors shall be 460 volt, 3 phase, 60 Hz totally enclosed fan cooled and manufactured in accordance with NEMA standards. Pump No. 1 and Pump No. 2 shall be 3 HP, 3500 RPM. Motors shall be selected so that they do not exceed nameplate HP rating throughout the programmed sequence of pump operation.

SYSTEM VALVES

Each pump discharge shall have a wafer style silent non-slam check valve with cast iron body and sized for a maximum loss of 3 PSI at design flow and be suitable for the maximum working pressure of the system.

HYDRO-PNEUMATIC TANK

Provide a hydro-pneumatic tank with a carbon steel shell and a replaceable F.D.A. approved heavy duty bladder to separate the air and water. No water shall come in contact with the metal walls of the tank. Features shall include an air fill valve and bottom system connection suitable for 100% drawdown.

Tank size and rating

The tank must be constructed in accordance with Section VIII of the ASME code and be N.B. stamped and shall be rated 132 gallon - 125 PSIG.

Tank mounting arrangement

The tank shall be mounted in a remote location as shown on the drawings.

VARIABLE FREQUENCY DRIVES

Provide and mount on the system skid two variable frequency drives of the PWM design suitable for variable torque applications using any standard NEMA Design B squirrel cage induction motor. Variable frequency drives shall be sized for the maximum possible amp draw throughout the programmed sequence of pump operation.

Standard Features

- Pulse Width Modulated
- Starts into a rotating load
- Keypad Operator Device including the following:
 - 2 Line Backlit LCD Display
 - Power On and Alarm/Fault Displays
- In Auto the drive follows signal from Logic Section of Control Panel
- Hand/off/auto switch and manual speed adjustment
- Auto Drive Shutdown for electrical fault
- Automatic restart after power fails shutdown
- Operational data displays include: Drive Speed (HZ), Motor Power, Energy (kWh), Current, Elapsed Time, RPM, and Motor Voltage
- Complete Service Diagnostics with fault history log.

The efficiency at full load and full speed will be 97% with a fundamental power factor of .98.

PRESSURE SENSOR/TRANSMITTER

Provide one pressure sensor/transmitter that provides a 4 to 20 mA DC output, compatible with the system controls, temperature and pressure requirements. Pressure sensor/transmitter shall have zero, span and damping devices. The transmitter shall be installed on the system discharge header and factory wired to the control panel.

SEQUENCE OF OPERATION

The lead pump shall run only as necessary to maintain system pressure and will be controlled automatically by means of a pressure sensor/transmitter and programmable logic controller (PLC) programmed to prevent short cycling. If the lead pump is unable to maintain system pressure the lag pump will be called on after a time delay and will operate in parallel with the lead pump in accordance with the PLC program. When one pump can handle the system demand the controls will shut down the lag pump. When a low or no flow condition is reached, the controls will accelerate the lead pump to charge the system and hydro-pneumatic tank then shut the lead pump down and alternate.

CONTROL PANEL

Logic Section

Provide, mount and wire on the skid a programmable logic controller in an enclosure to interface the signal from the pressure sensor to the VFD's and provide a stabilized response to speed up or slow down the pump or add the lag pump to meet system requirements. The controller shall provide setpoint adjustment, timer adjustment, PID functions and both system and controller self diagnostics via a touchscreen display. All user interface setpoints are easily accessible via the password protected display screen. Normal system operation is tuned to eliminate hunting. Controller shall have one RS 485 Communication port, real time calendar/clock and EEPROM memory transfer cartridge.

Power Section

Each system shall include a UL listed enclosed industrial control panel in a NEMA 1 enclosure, factory mounted and wired on the steel skid. The panel shall be furnished with individual pump disconnects with through the door handles, pump run lights, H-O-A selector switches and 115 volt fused control transformer.

STANDARD CONTROL PANEL FEATURES

UL LISTED ENCLOSED INDUSTRIAL CONTROL PANEL
INDIVIDUAL FUSED DISCONNECTS WITH EXTERNAL HANDLE
PROGRAMMABLE LOGIC CONTROLLER (PLC)
PUMP RUNNING LIGHTS
H/O/A SELECTOR SWITCHES
115 VOLT FUSED CONTROL CIRCUIT TRANSFORMER
PUMP MINIMUM RUN TIMERS
MOUNTED AND WIRED ON SKID
PUMP OPERATING AND SEQUENCE CONTROLS

CONTROL PANEL OPTIONS

CONTROL POWER (ON-OFF) SWITCH AND LIGHT
LOW SUCTION PRESSURE SHUTDOWN CIRCUIT WITH AUTO RESET, DELAY TIMER AND LIGHT
AUTO ALTERNATE (2) EQUAL PUMPS
MAIN DISCONNECT SWITCH FOR INCOMING POWER

FACTORY TEST

The booster system shall be hydrostatically tested and shall undergo a complete electric and hydraulic test from 0 to 100% design flow at the factory. All control devices including transmitters and all safety features shall be factory calibrated and tested. The owner's representative may witness the test.

WARRANTY

The booster system shall be warranted in writing against defects in materials or workmanship under normal use and service for a period of one year after date of original operation but not more than 18 months from date of shipment from the Company's factory when installed and used in accordance with good standard practice.

START-UP SERVICE

The service of a factory-trained representative shall be made available on the jobsite for start-up and instructing operating personnel.

2.8 SUBMERSIBLE SUMP PUMP AND ACCESSORIES FOR ELEVATOR PIT

- A. Sump pump system shall be Liberty Pumps ELV250 or equal and shall consist of the following:
 - 1. Alarm enclosure and alarm beacon that meets Type 3R Standards.
 - 2. Pre-mounted terminal block.
 - 3. Test/silence switch.
 - 4. Sensor float control switch with pipe clamp.
 - 5. Fifteen (15) feet of flexible 18 gauge, 2-conductor, water/oil-resistant cable.
 - 6. High impact, corrosion resistant PVC float.
 - 7. Hermetically sealed steel capsule with mercury-to-mercury contacts switch.
 - 8. Oil detector to shut pump off if oil is in sump.
- B. Submersible sump pump shall be designed to deliver 50 GPM against head of 23 feet, 1/3 HP, 110 volt single phase. Pump shall be furnished with bronze impeller, stainless steel shaft, and integral mounted float control.

2.9 WATER HEATERS

For sizes and requirements of all water heaters see schedules and details on the drawings. All storage tank type water heaters shall have brass drain valves and ASME T&P relief valve. The water heaters shall be piped and installed per manufacturer's recommendations. Provide flue venting for gas fired water heaters.

2.10 STORM DRAIN SYSTEM

- A. All storm drain piping inside the building, under slab, out to the connections at the service main shall be as follows.
 - 1. Above ground standard weight cast iron "No-Hub" as specified for sanitary sewer above ground.
 - 2. Underground shall be schedule 40 PVC as specified for underground sanitary sewer systems.
 - 3. Cleanouts shall be as specified for sanitary sewer, except covers shall have the word "Drain" cast in them.

2.11 COMPRESSED AIR SYSTEM PIPING

- A. All piping between the compressor and the outlet service valves shall be seamless type "K" copper tubing with brazed-type fittings. All piping shall be cleaned and purged utilizing compressed nitrogen.
- B. Provide where indicated on the drawings a coalescing filter. Filter shall remove liquid oil and water aerosols and fine particulate matter. Liquid aerosols shall be removed down to 0.001 ppm by weight and particulate matter to 0.01 micron. Filter pressure drop shall not exceed 3 psi wetted.
- C. Provide a coarse coalesce/particulate filter where indicated on the drawings. Filter shall remove liquid oil and water aerosols and particulate matter. Liquid aerosols shall be removed down to 0.5 ppm by weight and particulate matter down to 1 micron. Filter pressure drop shall not exceed 2 PSI.
- D. At each air compressor drop, provide an in line ball valve, drip leg and quick connect fitting.
- E. Air Compressor - Air compressor (10 HP) with 120-gallon horizontal tank, air-cooled aftercooler, automatic tank drain, 33.8 CFM @ 175 PSI, 460V, 3-phase. Champion Model HR10-12 or equal. Air Dryers - refrigerated air dryer Champion CRE120, sized for 120 CFM, 115V 1-phase.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All piping, waste and stacks shall be run concealed underground, in ceiling spaces, walls or in chases provided. The entire installation must present an appearance truly in keeping with the

best practice and indicative of skill and neatness. In areas of exposed ceilings piping shall be grouped together and run on common pipe hangers with piping run parallel to building lines.

- B. All material shall be installed in a neat and workmanlike manner by competent specialists for each sub-trade. The installation of any materials and equipment not meeting these standards may be condemned by the Architect and shall be removed and re-installed at no additional cost to the Owner. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the Owner.

3.2 INSTALLATION

- A. Pipe shall be laid to the grades and alignment indicated on the drawings. Each pipe shall be laid line to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. The interior of the pipe shall be cleaned of all dirt and superfluous materials of every description. Trenches shall be kept free from water until the pipe joining material has set and pipe shall not be laid when the conditions of the trench or the weather is unsuitable for such work. At times when the work is not in progress, open ends of pipe and fittings shall be securely closed, so that no trench water, earth or other substance will enter the pipe or fittings. Minimum compacted pipe coverage shall be 2'-0", or as indicated on drawings.
- B. Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be run closer horizontally than 6'-0" to water supply main except that the bottom of the water pipe will be at least twelve (12") inches above the top of the sewer pipe, both pipes may be laid in the same trench. Where sewer mains cross above water services the sewer piping for a distance of ten (10') feet each side of the crossing shall be cast-iron without any joint closer horizontally than three (3') feet to the crossing.

3.3 SANITARY SEWER PIPING

- A. New piping shall be a complete system to waste and vent lines from all fixtures.
- B. All waste lines shall be installed on a continuous waste and vent system as required by codes and/or regulations.
- C. All piping shall be installed straight and true and sized as indicated on drawings.
- D. All changes in direction shall be made by the use of 45 degree wyes, double wyes, long sweep quarter bend or 1/8 bends, except that single sanitary tees may be used on vertical stacks. Tees and crosses may be used in vent pipes.
- E. Cleanouts easily accessible shall provide at the foot of each vertical waste or soil stack. Cleanouts shall be of nominal size as the pipes up to four (4") inches and not less than four (4") inches for larger pipes. The distance between cleanouts in horizontal lines shall not exceed those distances required by local authorities, whether indicated or not.
- F. All cleanouts installed so as to be easily accessible, and all outside cleanouts installed flush with finished grade.

- G. Horizontal soil or waste lines shall be run at uniform grade of not less than 1/4" per foot. Horizontal lines shall be supported or anchored at intervals specified in BASIC MATERIALS AND METHODS. All stacks shall be supported at their base and every floor to the roof line and pipes shall be rigidly secured.
- H. Every fixture trap shall be protected against siphonage and back pressure and air circulation assured by means of a soil or waste stack vent, a continuous waste or soil vent, a loop or circuit vent.
- H. No vents shall be less than 2" in diameter and no case shall branch or main vent have a diameter less than half that of the soil or waste pipe served, or as required by local code.
- J. Make all arrangements with Local Authority for the inspection of the installation of the new sanitary sewer system, and pay all costs and assessed fees.

3.4 HOT WATER AND COLD WATER SYSTEMS

- A. This installation comprises a complete and operating system of hot and cold water distribution and connection to each and every fixture and appliance requiring this service and/or as indicated on drawings.
- B. All ends of tubing shall be square cut and burrs removed before assembling. Joints shall be thoroughly cleaned with sandpaper or emery cloth before applying the flux.
- C. All water supply piping, fittings, and fixtures shall be protected against water hammer shock, or surge pressure, by adequate air chambers.
- D. Each riser battery shall be valved in an accessible location.
- E. No hot water piping shall be run closer than six (6") inches from cold water pipes.
- F. Distribution and sizes shall be as indicated on drawings.
- G. Pitch all piping to low points to allow for system drainage.
- H. Make all arrangements with Local Authority for inspection of the new water system and for the building, pay all assessed costs and fees.

3.5 GAS PIPING

- A. Gas distribution system shall consist of a distribution system to each service point as indicated on drawings.
- B. Provide gas cocks shut-off valve, ball type, and union at each piece of equipment and where indicated on plans.
- C. Connections and piping shall be as shown on plans. Provide drip legs at all low points.
- D. Provide pipe sleeves at all places piping passes through walls. Sleeves shall be such as to provide not less than 1/3" clearance all around gas pipe.

- E. Run all gas lines on the roof or along the outside face of the exterior wall exposed and inside building exposed, or in accessible ventilated spaces. No gas piping shall be run under building slab.
- F. Install piping in accordance with NFPA 54 and IBC Gas Code latest edition.

3.5 STORM DRAIN SYSTEM

- A. All horizontal storm drain pipe shall be run at uniform grade of not less than 1/4" per foot. If a lesser slope is required because of on job conditions, contractor shall obtain permission before making the change.
- B. Horizontal lines inside and under the building shall be supported or anchored at intervals as specified in Section 15050.
- C. Connect storm drain piping to area drains as shown on the drawings and to site drainage piping and run to service main as shown on drawings.

3.6 MISCELLANEOUS ITEMS OF WORK

- A. Contractor shall be responsible for securing all information and data for connection to all utilities and pay all costs including meter fees and connection fees.
- B. Contractor shall provide temporary water and sewerage on site for use during construction period as required.
- C. All valves shall be installed so as to be easily accessible for cleaning, inspection maintenance, and operation.
- D. Provide access panels at all concealed valves.
- E. All welded piping to be welded by Certified welders skilled in the work to be done.
- F. No piping of dissimilar metals placed in contact or in close proximity with each other. Provide bronze valves wherever piping of dissimilar metals is jointed.
- G. Provide all necessary steel frames supports, anchor bolts, sleeves, etc., required for safe support of equipment and piping installed under this contract. The Mechanical Contractor shall be completely responsible for the accurate position and dimensions of all foundations and support times.

END OF SECTION

FIRE SUPPRESSION SYSTEM

SECTION 15500

PART 1 – GENERAL

1.1 SUMMARY

- A. Work under this Section shall include all labor, material, equipment, transportation, services and facilities necessary to complete the Fire Protection System for the building as shown on drawings and as specified herein without exception.
- B. Applicable provisions of GENERAL AND SUPPLEMENTARY CONDITIONS, DIVISION 1 and SECTION 23 05 00 shall apply to this Section as if written in full herein.
- C. The work shall include but is not necessarily limited to the following:
 - 1. Perform all Work required to provide and install pipe, fittings, valves, connections, hangers, supports, sleeves and appurtenances for rework and/or expansion of existing wet combination sprinkler systems with supplementary items necessary for complete, code compliant and approved installation. Note: Add a double check valve to the existing fire water riser. As a result, a fire pump and jockey pump shall be added to the system. The new fire pump supply shall be connected to the first floor sprinkler mains, the second floor sprinkler mains and the third floor sprinkler mains. A new standpipe system shall be provided for floors 1 and 2 capped for future work on the third floor. The sprinkler contractor shall determine if it is more cost effective to replace all piping on the first and second floors or to reuse the existing piping. Either option is approved provided the system meets, NFPA-13, 14, 20 and 101 requirements.
 - 2. Contractor shall include within his bid all materials and Work to provide 100% sprinkler protection for all areas in new construction or for the entire smoke compartment affected by renovation work.
 - 3. Size all branches and mains by hydraulic calculations. Contractor shall conduct a water flow test to obtain water supply information to determine actual available volume and pressures as a design basis for the system, including storage tank replenishment on new systems. Provide a 10 psi cushion for all hydraulic designs. This Contractor shall verify that the affected existing systems are configured and functioning properly according to NFPA 13. Hazard classifications for fire protection system design, installation and water supplies shall be in accordance with NFPA Standards. Sprinkler head locations and spacing shall be in accordance with NFPA 13 requirements.
 - 4. Interface all new flow and valve supervisory switches with building fire and smoke alarm systems.
 - 5. Provide temporary fire protection during the construction phase of Project. Inform and obtain approval from the Owner and General Contractor for any interruptions of existing fire protection, domestic water or fire alarm systems.
- D. Painting, unless otherwise specified is not included under this Section.

1.2 CODES AND STANDARDS

- A. Final systems design, materials, workmanship and testing shall conform to the following Codes and Standards, when same have jurisdiction.
 - 1. N.F.P.A. 13, 24 101, 33, 92B, 72, 174, 96 and all applicable Codes.
 - 2. Property Insurance Association of Louisiana.
 - 3. State of Louisiana Fire Marshal.
 - 4. International Building Code.

1.3 QUALITY ASSURANCE

- A. Contractor must be licensed in the State of Louisiana to perform sprinkler work, and must be regularly engaged in making such installation.
- B. Manufacturer: Provide equipment and accessories for work in this Section produced, meeting the requirements specified. Approved manufacturers:
 - 1. Sprinkler Heads: Reliable, Grinnell, Viking, Flexhead.
 - 2. Flow Switches: Notifier, Potter-Roemer, System Sensor.
 - 3. Tamper Switches: Notifier, Potter-Roemer, System Sensor.
 - 4. Gate Valves: Mueller, Nibco, Stockham, Kennedy.
 - 5. Butterfly Valves: Milwaukee, Nibco, Grinnell, Victaulic, Kennedy.
 - 6. Ball Valves: Milwaukee, Nibco, Stockham, Victaulic.
 - 7. Check Valves: Mueller, Nibco, Stockham, Grinnell, Victaulic.
 - 8. Grooved Fittings and Couplings: Grinnell, Anvil, Victaulic.
 - 9. Hose Valves: Elkhart, Larsen, Potter-Roemer.
 - 10. Fire Department Connections: Elkhart, Larsen, Potter-Roemer.
 - 11. Electric or Water Motor Alarm Bells: Potter-Roemer, Reliable, Victaulic, Grinnell, and Viking.
 - 12. In-Building Water Supply Riser: Ames.

1.4 SHOP DRAWINGS AND DATA SHEETS

- A. Contractor to provide Architect with shop drawings and calculations including flow and hydrant tests for Owner's approval prior to commencement of work. Comply with Division 1 Sections' submittal requirements. Work is not to be started until: 1) shop drawings have been corrected to conform to Owner's approval, 2) copies of corrected drawings shall be submitted to the Architect and State Fire Marshall, and 3) drawings have been returned from the State Fire Marshall with review comments. Contractor shall submit Owner's stamped approved

drawings to the State Fire Marshall for his review. This Contractor shall pay for all review fees required by the State Fire Marshall.

- B. The Contractor shall provide written verification as part of the State Fire Marshal submittal package stating that the proposed location of the fire department connection, the outlet diameters, fitting type and thread type comply with the requirements of the local fire department.

1.5 AS-BUILT DRAWINGS

- A. Contractor shall maintain a set of drawings showing exact locations and sizes of all piping, valves and related items, which shall be corrected daily and shown every change from original contract drawings and specifications.
- B. On completion of the work, Contractor shall provide two (2) sets of drawings corrected to show all changes noted on "As-Built" Drawings. Refer to Division 1 Sections for record documents procedures.

1.6 CUTTING AND PATCHING

- A. Contractor to provide all opening for proper installation of the work specified, in foundations, walls, floors, ceilings, partitions, stairways, etc., and do all patching and repairing required, except where otherwise noted on drawings.
- B. Cutting structural members for the passageway of sprinkler piping or for pipe hanger fastenings will NOT be permitted.
- C. Holes through walls, floors, and ceilings shall be large enough to accommodate pipe expansion. Suitable plates shall be provided at each hole to insure the effectiveness of the floor or wall as a fire stop.

1.7 INTERFERENCE

The Sprinkler Contractor shall coordinate with other trades so that interference between piping, conduit, ductwork, equipment, apparatus, architectural and structural work will be avoided. In case of interference developing, the Architect or his authorized representative shall decide which equipment, piping, ductwork, etc., must be relocated, regardless of which was first installed.

1.8 TAXES

Contractor shall include all taxes required.

1.9 PERMITS, FEES AND INSPECTION

This Contractor shall obtain and pay for all permits and shall pay all fees required in connection with this work, not covered by permits obtained by General Contractor.

1.10 CERTIFICATE OF APPROVAL

Upon completion of all work, this Contractor shall furnish the Owner a certificate of approval from such authorities as may have jurisdiction.

1.11 CLEANING UP

This Contractor shall at all times during construction keep the premises free from waste materials, or rubbish caused by his employees or work and at completion shall remove all surplus materials leaving the building in a clean swept condition.

PART 2 - PRODUCTS AND INSTALLATION

2.1 GENERAL

- B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- C. All piping, materials and equipment used in the installation of sprinkler and standpipe systems shall be new and listed as approved by the Underwriters' Laboratories, Inc., List of Inspected Fire Protection Equipment and Materials and the Factory Mutual Testing Laboratories List of Approved Equipment, Fire Protection Devices and Devices Involving Fire Hazard and shall be the latest design of the manufacturer.
- D. Pressure ratings of pipe, fittings, valves, gauges and all other water carrying appurtenances shall be suitable for the designed system pressures in which they are installed.
- E. The installing Contractor shall identify piping, fire department connections, valves and hydraulic design information in accordance with applicable NFPA Standards.

2.1 WATER CONNECTION

Connection to the city water main for the fire protection systems shall be provided under this Contract. This Contractor shall make all arrangements and pay all costs for this connection. All work shall be in compliance with NFPA – 24.

2.2 MAIN CONTROL VALVE

O.S. & Y gate valve to be installed on the main riser. Provide contactor on valve compatible with fire alarm system to indicate when valve is closed, connection to fire alarm system shall be by fire alarm contractor.

2.3 MAIN DRAIN

Main drain valve and piping to properly drain each system shall be located at each system riser and piped to open air outside the building.

2.4 PIPE AND FITTINGS

- A. All interior pipe shall be ASTM A135 Schedule 40 black steel pipe with malleable or cast iron screw fittings, or cut grove fittings similar to Victaulic, Grinnell, or equal, as required. Fittings shall be ASME B16.3 Class 300 standard pattern with threads according to ASME B1.20.1. Provide all required pipe supports under building and above ground in accordance with National Fire Codes. Schedule 10 black steel piping may be used for 2-1/2" and larger pipe sizes. FlexHead: Flexible fire sprinkler hose with threaded end fittings are acceptable.
- B. Exterior piping shall be PVC C-900, class 150 with bell and spigot rubber gasket joints. Pipe shall be UL listed. Fittings shall be ductile iron with mechanical joints and shall meet AWWA C110 Class 250, or AWWA Class 153, Class 350. Provide stainless steel riser in floor from underground piping.
- C. All piping shall be manufactured in the United States of America.
- D. All piping and fittings shall be rated for the hydraulic pressure encountered throughout the system.

2.5 SPRINKLERS

- A. Sprinkler heads in unfinished ceiling areas to be brass upright.
- B. Sprinkler heads in finished areas shall be concealed heads with white cover unless noted differently.
- C. All heads in acoustical tile areas shall be centered in the tile, both ways.
- D. Contractor shall include, in his bid, any and all heads required to meet all applicable sections of NFPA 13, weather indicated on the drawings or not.
- E. It is the intent of this section that the contractor provide a complete and operational system that shall meet all codes and that all costs shall be included in this bid price.
- F. All heads to be quick response type, unless noted or required otherwise.
- G. Provide (10) ten additional brass upright and (10) ten additional concealed heads to be installed as directed by the Engineer. Include approximately 25 feet of piping and necessary fittings for each head.

2.6 SPRINKLER SYSTEMS

- A. Wet pipe sprinkler systems shall be provided to all areas of the building. These systems shall be designed for a Light Hazard Occupancy, except as defined below.

- B. Provide ground level fire department Siamese connection where shown on the drawings. Connections shall be Potter-Romer Series 5100 or Elkhart Brass Company 163, chrome plated, flush type fitted with chained caps. Threads shall match Fire Department requirements. Connect Siamese to fire protection system. Siamese connection shall have cast signage to read "automatic sprinkler system".
- C. All equipment rooms, mechanical rooms and electrical rooms shall be provided with a sprinkler system designed for ordinary hazard group 1 occupancy. Shop areas and storage rooms shall be ordinary hazard group 2.
- D. Provide full size fire pump bypass piping.
- E. Provide water curtain system at locations as shown on plans to protect glass walls. The sprinklers shall be spaced not to exceed 6' and shall be designed for 3 GPM per linear foot discharge with no sprinkler flowing less than 15 GPM. The water curtain demand shall be added to the building hydraulic system demand. Water curtain shall conform to NFA-13 requirements.
- F. Prohibited Items:
 - Locating piping within 42" of electrical switchboards, panels, IT equipment. Provide 304 SS water shield protecting electrical equipment as a last resort.
 - Wall mounted sprinkler heads.
 - Flanged pipe, except for main riser.

2.7 VALVES

- A. All valves used in the fire protection system shall be UL listed and FM approved with 175 psig non shock minimum working pressure rating. All valves used to control the flow of water to and within standpipe and sprinkler systems shall be listed indicating type complete with electric supervisory switches. Coordinate wiring with the electrical Contractor.
- B. Gate valves, 2 inches and smaller shall be UL 262 cast bronze, threaded ends, solid wedge, outside screw and yoke, rising stem.
- A. Gate valves 2-1/2" and larger shall be 262, iron body bronze mounted, taper wedge, outside screw and yoke, rising stem.
- B. Swing check valves, 2-1/2" and larger shall be UL 312, cast-iron body and bolted cap with bronze or cast iron disc with bronze disc ring.

2.8 GENERAL CONSTRUCTION WORK

Provide all openings for proper installation of work specified, in walls, ceilings, and floors and do all patching of same as required.

2.9 ENGINEERING

Prior to installation of any work, this Contractor is to prepare installation and fabrication drawings and have same approved by the insurance authority having jurisdiction and Owner's representative.

2.10 INSURANCE

This Contractor is to furnish certificates of insurance prior to commencing work.

2.11 PERMITS

This Contractor is to pay for all permits required for this portion of the work.

2.12 HYDROSTATIC TEST

This Contractor is to hydrostatically test the entire interior system to 200 PSI for a period of two (2) hours in accordance with NFPA 13, and show evidence that he has had an authorized representative of the Owner present for the test.

2.13 WARRANTY

This Contractor is to warrant all material and workmanship, free from defects, for a period of one (1) year from date of acceptance of installation.

2.14 CODE COMPLIANCE

- A. The Contractor shall flush all piping as required by NFPA – 13 and 24. Flow rates for flushing shall be as required by these codes.
- B. All signage shall be provided in accordance with NFPA – 13 and 24.
- C. All test certificates in NFPA 13 and 24 shall be completed by Contractor and submitted as part of review process.
- D. Contractor shall review reflected ceiling, mechanical, fire protection and electrical plans and include all heads as required by NFPA-13 for complete sprinkler coverage including coverage around obstructions such as ductwork, piping and ceiling features.

2.15 FIRE PUMP SYSTEM

Provide fire pump system as indicated on Plans and specified below; complete with main pump, jockey pump, controllers, sensing lines, and appurtenances as required for a complete UL approved system.

Fire pump shall be Aurora, or approved equal, inline Underwriters' Listed and Approved assembly, complete with motor accessories and control panel, all conforming to the standards of the NFPA Pamphlet #20, current edition.

1. One Aurora Model 4-383-13 vertical inline centrifugal fire pump listed by Underwriter's Laboratory and approved by Factory Mutual having a capacity of 750 GPM for a pressure boost of 54 PSIG. Pressure at the pump suction will be 30 PSIG, giving a discharge pressure of 84 PSIG. The pump shall have a bronze impeller, bronze case wear ring, packing gland and shaft sleeve. The pump discharge flange shall be 125 PSI bolt pattern. The pump shall be fitted with a Teflon lantern ring when the suction pressure is 30 PSIG or less. Pump to be directly connected to 40 HP, 1770 RPM, vertical, solid shaft, open drip-proof motor, suitable for an electrical supply of 460 volts, 3 phase and 60 hertz with a 1.15 service factor. Pump discharge pressure and flow to be revised if necessary to satisfy sprinkler and standpipe requirements.
2. Pump shall be furnished complete with the accessories listed below:
 1. 1 - Eccentric Suction Reducer
 2. 1 - Concentric Discharge Increaser
 3. 1 - Automatic Air Release Valve
 4. 1 - Casing Relief Valve
 5. 1 - Set of Approved Suction and Discharge Gauges
 6. 1 - Capacity Plate
 7. 1 - Test Header with Test Valves, Cans and Chains

Fire Pump Controller shall be a unit listed by Underwriters Laboratories and approved by Factory Mutual Research for fire pump service. The controller shall meet the requirements of NFPA 20. The controller shall be suitable for use on a circuit capable of delivering 100,000 Amps symmetrical short circuit current. It shall be completely factory wired, assembled, and tested prior to shipment.

The controller shall be of the combined manual automatic type sized to operate a 40_HP, 460 VAC, 60 Hz motor and designed for solid state soft start. The controller shall be housed in a NEMA 2 Drip-proof indoor enclosure, fabricated from heavy gauge cold rolled steel per the requirements of UL 508.

All controller components shall be UL Listed or UL Recognized, shall be front mounted and wired allowing the controller to mount flush against a wall.

The controller shall include the following standard features:

- NEMA Type 2 drip proof metal freestanding enclosure
- Operator Interface Device (OID) with 4 lines by 20 character display with large character backlit LCD capable of being read in both direct sunlight or dark lighting conditions
- 10 pushbuttons for easy screen navigation, system test, lamp test, alarm reset, and horn silencing
- Multicolored LED's for alarm and mode annunciation
- LEDs shall be labeled with removable labels to allow for easy field modification of language changes
- All controller settings shall be programmable through the OID and shall be protected by two password levels
- All features shall be enabled or disabled through the OID, no jumpers or external wires shall be needed or allowed to activate or de-activate a feature
- The system status data shall be displayed on the OID. The displayed items shall include: System pressure, Phase to Phase (AB, BC, AC) voltage, Phase current (A, B, C), System Events and Notifications, Current time and date, Number of starts, Total motor run hours, Displayed countdown timers for: Sequential motor start and motor stop, Status of Automatic Stop Setting.
- Audible horn with silence feature for silencable alarms
- Lamp test feature

- Foreign languages selectable through the OID
- Microprocessor based logic with real time/date clock capable of running a minimum of 14 days without AC power connected to controller and non-volatile flash memory to permanently store the continuous pressure log, event log, alarm log and all user changeable set points and system data. Battery backup of any kind not allowed.
- Input and output status LED's to provide visual indication of each discrete input's or output's on/off status
- One RS485 Serial Port
- MODBUS Communication Protocol via RS485 port
- All wiring terminals on PCB's shall be removable type
- Service Entrance Rated
- Weekly Test Solenoid
- The controller shall include an isolating switch and circuit breaker rated at least 115 percent of the motor full load current. The isolating switch and circuit breaker shall be externally operable via a single operating handle. When moving the handle from the OFF to ON position, the handle shall sequence the isolating switch on the first and then the circuit breaker. When the handle is moved from the ON to OFF position, the handle shall sequence the circuit breaker off first and then the isolating switch. This sequencing operation shall prevent the isolating switch from interrupting motor current. The operating handle shall be capable of being padlocked in either the ON or OFF position. The operating handle shall permit normal tripping operation of the circuit breaker.

As standard the controller shall include 6 discrete auxiliary inputs, 9 form 'C' auxiliary relay outputs. These auxiliary inputs and outputs are in addition to those mandated by NFPA 20. All auxiliary inputs, outputs, and OID screens shall be field programmable through the OID. This permits a multitude of customizable controller configurations to meet each installations unique needs without adding cost to the controller. The use of jumpers, soldering, or other external components are not allowed.

Automatic Transfer Switch: UL Listed for Fire Pump Service, sized at least 115% of motor full load current and shall conform to all requirements of NFPA 20 Chapter 10. It shall be installed in a barriered compartment of the fire pump controller. The complete assembly, controller and transfer switch, shall be shipped as a single unit.

The controller shall be completely tested at the factory prior to shipment. This test shall verify proper operation of all normal automatic and manual functions along with the continuity of all primary power circuits equal to twice the rated voltage plus 1000 volts for one minute. The controller shall be Tornatech model GPS+GPU.

Pump, driver and all controls and necessary attachments, specified herein, shall be purchased under a unit contract. The pump manufacturer shall assume unit responsibility and shall provide the services of a qualified engineer to supervise installation of equipment, align coupling and be available to conduct final acceptance tests along with Underwriting Authorities.

Provide one (1) Aurora Model PVM1-7 multistage vertical pump or approved equal close coupled centrifugal jockey pump complete with motor and control panel, all conforming to the standards of the NFPA Pamphlet #20, current edition.

Pump shall be a bronze fitted pump with stainless steel case, stainless steel impellers, and mechanical seal designed to deliver 7.5 GPM against a total dynamic head of 70 psi when operating at 3500 RPM with a suction pressure of 30 psi. Pump shall be furnished complete with

a vertically mounted vertical solid shaft, open, drip-proof, ball bearing, squirrel cage induction motor of not less than 3/4 HP, 3500 RPM designed for 460 volt, 3 phase, 60 cycle service and have a 1.15 service factor.

Jockey pump controller shall be suitable for jockey pump service and the motor listed above for 460 volt, 3 phase service. Controller shall include a 3-pull fusible disconnect switch, running period timer, magnetic across-the-line type starter, three position manual off automatic selector switch, Bourdon tube type pressure regulator and be mounted in a NEMA 2 enclosure. The controller shall be Tornatech model JP3.

Fire and jockey pumps to be factory tested with certified test curves submitted to Architect and approving Authorities prior to pump delivery. Both pumps to be field pressure and flow tested in accordance with NFPA #20.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All installation shall be in accordance with manufacturer's published recommendations.
- B. Install all materials and products in accordance with manufacturer's published recommendations. Use tools manufactured for the installation of the specific material or product.
- C. Sprinkler heads shall be located in a symmetrical pattern related to ceiling features such as grid, beams, light fixtures, diffusers, etc. and where applicable, heads shall be located symmetrically with the ceiling grid, centered in two directions. Locate heads to provide code required distances away from lights, exit signs, etc., and all other items that could interfere or effect sprinkler discharge.
- D. Apply temporary protective covers during construction to ensure that sprinkler heads and escutcheons do not receive field paint.
- E. Install fire sprinkler head cages/guards to sprinkler heads to protect heads susceptible to mechanical injury and to reduce the possible of accidental discharge (i.e. mechanical rooms, elevator shafts/pits, etc.).
- F. Inspector's test valves shall be installed for each sprinkler control valve assembly equipped with a flow switch and piped to a stairwell drain test riser within the building. When used in combination with the drain and test riser requirements for testing standpipes equipped with pressure-regulating hose valves, the drain test riser size shall be a minimum size of 3 inches. Provide a 2-1/2" female test connection with cap on each floor of the 3" test riser with pressure reducing hose valves. Each drain test riser discharge shall be piped to the exterior of the building. The exterior discharge point shall not discharge on a sidewalk, driveway or any other area that could result in staining, water accumulation or soil erosion. When exterior piping is not feasible, the drain test riser shall be piped to a suitable drain having sufficient capacity to accept full flow of pressure-regulating hose valves.
- G. Auxiliary drains shall be installed on all sprinkler systems that do not allow complete drainage from the main drain. Any low point areas of a sprinkler system shall have a means of drainage either towards the main drain or auxiliary drain to eliminate any trapped water in the system.

- H. Provide hangers for horizontal piping at intervals not exceeding twelve feet for pipe sizes 1-1/4" and smaller or fifteen feet for pipe sizes 1-1/2" and larger, and as recommended within NFPA.
- I. Route piping in orderly manner, plumb and parallel to building structure and concealed above ceilings where possible. Locate concealed valves, switches and alarm connections in accessible location, and coordinate size and location of access panels/doors with General Contractor.
- J. Install piping to conserve building space and not interfere with use of space and other work. Coordinate with other trades to avoid conflicts and provide all required offsets, piping, auxiliary drains, etc. to properly install system.
- K. Group piping whenever practical at common elevations.
- L. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- M. Flange and coupling bolts shall be torque in sequence per manufacturer specifications.
- N. Pipe joints, clamps, groove couplings, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.
- O. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- P. Provide an approved splash block at the point of drain or system test discharge outside of the building, where the ground may be disturbed by the flow of water.
- Q. Prepare pipe, fittings, supports and accessories for finish painting where required.
- R. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods and properly anchor and support.
- S. Do not penetrate building structural members unless indicated otherwise on Contract Drawings.
- T. Each pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.
- U. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.
- V. Seal all penetrations through exterior building walls and grade beams air and watertight.
- W. Install valves with stems upright, not inverted. All valves shall be located such that the removal of their bonnets is possible. Valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. Valves shall be installed as nearly as possible to the locations indicated in the Construction Drawings. Any change in valve location must be so indicated on the Record Drawings. Remove protective coatings after installation.
- X. Provide drain valves at main shutoff valves, low points of piping and apparatus.
- Y. Locate and secure hose cabinets plumb and level. Locate angle valve in cabinet at 60 inches above floor.

- Z. Provide two-hour enclosure around all fire standpipe piping routed outside fire stairwell.
- AA. All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary and all rust or dirt from storage or lying on the ground shall be removed. Flush entire system of foreign matter.
- BB. Heat generated by welding or soldering procedures shall not be transmitted to valves, groove couplings, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary and allow heated piping to cool to ambient temperature before attachment.
- CC. All screw joints shall be made with taper threads properly cut. Joints shall be made tight with Teflon tape or non-toxic joint compound applied to the pipe threads only and not to fittings. When threads are cut on pipes, the ends shall be carefully reamed to remove any burrs. Before installing pipe that has been cut and threaded, the lengths of pipe shall be upended and hammered to remove all shavings and foreign material.

3.02 ELEVATOR SPRINKLER PROTECTION

- DD. Elevator fire protection shall comply with NFPA 13, NFPA 70, NFPA 72, and ANSI/ASME A17.1 or A17.3 as applicable.
- EE. When sprinklers are installed in elevator equipment rooms, the electrical power to the elevator controller must shut down prior to sprinkler activation. A heat detector shall activate an independently controlled shunt trip circuit breaker when the temperature in the machine room exceeds the setting of the heat detector. The detector shall have both a lower temperature rating and a higher sensitivity (lower Response Time Index) as compared to the sprinkler. Sprinkler heads shall be rated at 212°F and heat detectors shall be rated at 135°F. Heat detectors used to shut down elevator power prior to sprinkler operation shall be placed within two feet of each sprinkler head and connected to the fire alarm control panel.
- FF. Smoke detectors shall be provided to initiate phase one elevator recall, sending cars to the appropriate level prior to electrical power shut-down.
- GG. No sprinkler risers shall be permitted inside any hoist way. Sprinkler branch lines shall enter hoist ways only where a sprinkler is required.

3.03 WELDED PIPING

- HH. All welding materials, procedures, qualifications and records shall comply with applicable NFPA requirements.

3.04 SYSTEM TESTING AND FLUSHING

- II. Testing, cleaning, flushing and inspection shall be done in accordance with NFPA requirements.
- JJ. The installing Contractor shall complete and sign the appropriate Contractor's Material and Test Certificates included within NFPA 13 and 14.

3.05 ZONING

- KK. All flow switches and tamper switches shall relay their activation to each annunciator panel and the main fire alarm panel.

LL. Sprinkler system zoning shall coincide with building smoke compartmentalization unless noted otherwise on Contract Drawings. As a minimum, each floor level shall be a separate zone.

3.06 TRAINING

MM. Contractor shall provide for the service of a competent, trained and experienced agent to instruct and acquaint the Owner with the proper functioning, operation and maintenance of the fire protection systems and all installed components.

3.07 WARRANTY

NN. The complete system shall be warranted in writing against defects in materials or Workmanship under normal use and service for a period of one year after date of Substantial Completion.

END OF SECTION

SECTION 15550 - CLEAN AGENT FIRE SUPPRESSION SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Alarm operation description.
- B. Trouble operation description.
- C. Control and supervisory systems.
- D. Fire suppression agent.
- E. Agent storage and distribution components.
- F. Signs and identification.
- G. Pipe fittings, wire, and conduit.

1.02 DESCRIPTION

- A. The mezzanine archival storage room to be protected shall be considered a single zone for fire suppression protection. Refer to drawings for areas to be protected.
- B. The quantity of the agent shall be that necessary to maintain seven percent minimum concentration for at least ten minutes. Such factors as unclosable openings (if any), "rundown" time for fans, time required for dampers to close, and all other features of the facility that could affect concentration shall be considered.
- C. The design discharge time shall be one minute.
- D. Design and operation of the system shall comply at a minimum with the appropriate requirements of NFPA 2001 and the requirements of the nationally recognized testing authorities for which listings or approvals have been obtained.
- E. Fire Protection System: Total flooding of hazard area with fire extinguishing agent, to extinguishing fire.
- F. Locate extinguishing agent supply and back-up supply in each hazard area.
- G. System is fixed installation with equipment designed and installed to provide fire-extinguishing capability for the area as indicated.

1.03 REFERENCES

- A. Louisiana State Fire Marshal (LSFM):
- B. American Society of Mechanical Engineers (ASME):
 - 1. ASME B16.3 Malleable Iron Threaded Fittings
 - 2. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings
 - 3. ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - 4. ASME B31.1 Power Piping
 - 5. ASME B40.1 Gages – Pressure Indicating Dial Type – Elastic Element
 - 6. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 – Rules for Construction of Pressure Vessels.
 - 7. ASME Boiler and Pressure Vessel Code, Section IX – Welding and Brazing Qualifications.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
 - 2. ASTM A106 Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
 - 3. ASTM A135 Standard Specification for Electric-Resistance-Welded Steel Pipe

4. ASTM A234/A234M Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
5. ASTM B32 Standard Specification for Solder Metal
6. ASTM B88 Standard Specification for Seamless Copper Water Tube (ASTM B88M – Standard Specifications for Seamless Copper Water Tube (Metric).
- D. American Welding Society (AWS):
 1. AWS A5.8 Specifications for Filler Metal for Brazing and Braze Welding
 2. AWS D1.1 Structural Welding Code - Steel
- E. National Electrical Manufacturers Association (NEMA):
 1. NEMA ICS 6 Industrial Control and Systems: Enclosures
- F. National Fire Protection Association (NFPA):
 1. NFPA 70 National Electrical Code
 2. NFPA 72 National Fire Alarm Code
 3. NFPA 75 Electronic Computer Rooms
 4. NFPA 2001 Clean Agent Fire Extinguishing Systems
- G. Underwriters Laboratories Inc. (UL):
 1. UL 393 Indicating Pressure Gages for Fire-Protection Service
 2. UL 404 Gages, Indicating Pressure, for Compressed Gas Service

1.06 SUBMITTALS

- A. Shop Drawings and Data:
 1. All drawings and calculations shall be prepared in accordance with NFPA 2001.
 2. Drawings shall indicate locations, installation details, and operation details of all equipment and piping, control diagram, wiring diagram and sequence of operation associated with the fire suppression system.
 3. Piping plan view and detail drawings shall be drawn to scale and isometrics dimensioned to show the entire storage and distribution system, the nozzle and detector location, and layout of annunciator final graphics. The detector and nozzle locations shall be coordinated with lighting fixtures, diffusers, ductwork, and other equipment installed in the protected room. Indicate manual pull station, control panel, and accessory locations and details.
 4. Electrical drawings shall indicate the complete sequence of operations of the system, termination diagrams and locations of interfaces with other systems.
 5. Calculations shall be submitted demonstrating that the proposed system can provide the design concentration within the design discharge time.
 6. Calculations shall be submitted showing required battery capacity, verify system pressure, nozzle flow rate, orifice code numbers, piping pressure losses, component flow data and pipe sizes.
- B. Louisiana State Fire Marshal: Shop Drawings of the clean agent fire suppression system shall be submitted to the Engineer for submission to the State Fire Marshal for approval. Shop Drawings require approval of the State Fire Marshal before any installation work may begin.
- C. Certificates of Compliance: Submit such certified test reports for materials and equipment to demonstrate compliance with specification requirements.
- D. Product Data: Material and equipment information shall include manufacturer's catalog cuts and technical data for each of the following components or devices used in the system:
 1. Smoke sensors;
 2. Manual discharge switches (pull stations);
 3. Control panel;
 4. Release devices;
 5. Alarm devices;

- 6. Storage containers;
- 7. Mounting brackets;
- 8. Nozzles;
- 9. Abort stations; and
- 10. Contact monitor modules.
- E. Operation and Maintenance Data: Submit operation and maintenance data for the equipment and system. Include recommended spare parts list.
- F. Certified Test Reports: Submit certified test reports that indicate successful completion of all tests performed as required by Article 3.04 herein.
- G. Manufacturer: Certify that system meets or exceeds specified requirements and NFPA 2001.

1.07 QUALITY ASSURANCE

- A. Qualifications of the System Designer and Installer:
 - 1. The system installer or subcontractor for this work shall possess a valid Louisiana Contractor's License. The fire suppression system shall be designed by an experienced and qualified individual or firm regularly engaged in the design of clean agent fire extinguishing systems.
 - 2. The installer shall maintain a 24-hour, seven-day-a-week telephone number for emergencies. Factory-trained personnel shall be kept on call for emergency service at all times.
- B. Identification of Materials and Equipment: Materials and equipment shall be clearly marked or stamped with the manufacturer's name, nameplate data or stamp, rating, and conformance with corresponding standard number, as applicable.
- C. Perform work in accordance with NFPA 70 and NFPA 72, applicable UL standards and requirements of applicable codes and ordinance.
- D. Indicate manufacturer's name and pressure rating on valve body. Indicate manufacturer, type and size, part number, orifice code or orifice diameter on discharge nozzles. Markings shall be standard and visible after installation.
- E. Certified Tests and Listings: Fire protection material and equipment shall be approved or listed by a nationally recognized testing laboratory of fire protection equipment for this application.
- F. Components of the system, as listed in Article 1.06.E herein, shall be the products of one manufacturer.
- G. Equipment shall be new and shall be of the most current design available from the manufacturer.
- H. Welding Materials and Procedures: Conform to ASME Section IX.

1.08 DESIGN REQUIREMENTS

- A. Provide sufficient amount of fire extinguishing agent liquid to convert into fire extinguishing agent vapor. Consider the following when computing volume:
 - 1. Volume of hazard area.
 - 2. Specific volume of fire extinguishing agent vapor.
 - 3. Additional quantities of fire extinguishing agent required to compensate for openings, pipe losses, and nitrogen dilution.
 - 4. Forced ventilation, fan coast-down time, and damper actuation time.
 - 5. Other special conditions affecting extinguishing efficiency.
- B. Interface system with building fire alarm system.
- C. Manufacturer Qualification: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience. Fike systems are not allowed.

1.09 REGULATORY REQUIREMENTS

- A. Conform to applicable code for system design, fabrication, and installation.
- B. Conform to NFPA 70 and NFPA 72 code for electrical wiring and wiring devices.
- C. Provide certification of inspection approval of fire protection system by authority having jurisdiction.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., and acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials and components on site in shipping containers. Inspect for damage.
- B. Delivery and store equipment in shipping containers with labeling in place. Deliver fire extinguishing agent in approved containers.

1.11 MAINTENANCE SERVICE

- A. Conduct inspections 6 months and 12 months from date of Substantial Completion to verify proper operation of system and to check agent container weight and pressure. Include a thorough check of controls, detection and alarm systems.
- B. Submit documents, certifying satisfactory system conditions. Include manufacturer's certificate of acceptance of Inspector's qualifications.

1.12 SITE CONDITIONS

- A. Inspect surfaces and structures where the system components will be anchored or fastened before the work of this Section begins. Determine that surfaces and structures are capable of supporting the system components and their weight.
- B. Coordinate the installation of the system with the station alarm and detection system and other systems and components, pipes, and conduits, so as to avoid conflicts of space and installation.

PART 2 – PRODUCTS

2.01 ALARM OPERATION DESCRIPTION

- A. Alarm Phase I: One hundred percent smoke density at any sensor shall trigger or activate equipment functions as follows:
 - 1. Annunciate the device status and its location at the system control panel;
 - 2. Cause a pre-alarm audio-visual (horn) to slow modulate within the protected zone;
 - 3. Send an alarm signal via dry contact closure to the station fire alarm control panel and
 - 4. Record the event in the system control panel's nonvolatile RAM memory buffer for post event recall and analysis.
 - 5. Shut down air conditioning system and close dampers.
- B. Alarm Phase II: One hundred percent smoke density at any second sensor within the same protected area shall trigger or activate equipment functions as follows:
 - 1. Annunciate the device status and its location at the system control panel;
 - 2. Cause a pre-discharge audio/visual alarm (horn) to fast modulate within the protected zone;
 - 3. Send a pre-discharge signal via dry contact closure to the station fire alarm control panel;
 - 4. Record the event in the system control panel's nonvolatile RAM memory buffer for post event recall and analysis; and
 - 5. Activate a thirty-second time delay.

C. Alarm Phase III: Agent Discharge:

1. After the 30-second time delay has expired the initiator shall be activated to release the fire-extinguishing agent.
2. Upon discharge, warning horn/lights shall activate continuously at all entrances to the protected area.
3. Record the event in the system control panel's nonvolatile RAM memory buffer for post event recall and analysis.

2.02 TROUBLE OPERATION DESCRIPTION

A. Trouble Conditions: The system fire detection system shall provide the following sequence of operation for any trouble condition:

1. Display a custom message identifying the device in trouble.
2. Record the event in the system control panel's nonvolatile RAM memory buffer for post event recall and analysis.
3. Send a trouble signal via dry contact closure to the existing fire alarm control panel.

2.03 MATERIALS AND EQUIPMENT

A. General Requirements:

1. Equipment and accessories furnished hereunder shall be standard components of a specified manufacturer. Catalog numbers and model designations shall indicate design, quality, and type of material as well as required operating characteristics.
2. Field fabricated equipment not supplied by the manufacturer will not be acceptable unless first approved by the Engineer.
3. Locks for all cabinets shall be keyed alike.

B. Control and Supervisory Systems:

1. System Control Panel: (Red in color)
 - a. The system control panel shall be red in color, and shall process all input signals, sequence the levels of alarms, and provide outputs to the extinguishing agent storage containers. Auxiliary outputs and dry contacts shall be available to shut down fans, activate dampers, contact other agencies, or annunciate to remote devices. The system shall have standby batteries and charger for continuous operation of detection, alarm, actuation and supervision function to provide a minimum of 24 hours of emergency power. The system control panel shall provide for either a Style "D" or a Style "B" (allowing T-Tapping) as defined in NFPA 72, type wiring and shall utilize initiating devices connected in parallel to provide automatic battery switch-over upon failure of primary power supply.
 - b. The system control panel shall utilize parallel agent release modules as a method of discharging the agent. The operation of a discharge signal shall immediately cause the appropriate agent release modules to activate and release agent. The initiator circuit shall be a parallel Style "D" circuit. Any system utilizing series initiators, series solenoids or mechanically activated solenoids is unacceptable. All initiator wiring shall be fully supervised.
2. Central Control Module (CCM): This module shall control, supervise, and continuously monitor the entire system through the use of an industrial grade 16-bit micro controller. This module shall include a backlit liquid crystal display (LCD) with up to 40 alphanumeric characters that provide individual custom messages associated with every addressable device in the system. The CCM shall include touch membrane switches for each of the following:
 - a. Location: Display a 40 character custom message associated with the individually

addressable devices reporting to the CCM or a manufacturer-specified message for devices (i.e. door holders, air conditioning units) supervised and controlled by the CCM.

b. Next Trouble: Displays the chronological sequence of individual addressable devices in trouble reporting to the CCM or a manufacturer-specified message for devices supervised and controlled by the CCM.

c. Next Alarm: Displays the chronological sequence of individual addressable devices in alarm reporting to the CCM.

d. History Buffer: The CCM shall contain a 256-event nonvolatile history buffer. This history shall be retrieved by downloading the information through an internal RS232 port, and USB port to a personal computer and printer without having to purchase additional software.

e. Field Programming: This system shall be fully field programmable and shall not require factory assistance for reconfiguration of any kind.

f. Expansion Capability: To allow for future expansions, the central control module shall be capable of connecting a minimum of 1016 individual addresses.

g. Approved as alarm and releasing device, with solid-state internal circuitry enclosed in NEMA ICS 6, Type 1 cabinet.

h. Provide supervision to NFPA 72, Class A of following circuits for wire break or ground faults:

- 1) Zone detection loops.
- 2) Remote manual discharge stations.
- 3) Suppression system solenoid valves.
- 4) Power supply and circuit wiring and fuse.
- 5) Battery interconnecting wires and fuse.
- 6) Alarm in abort mode.

i. Equip panel with following standard feature:

- 1) Visual and audible annunciation of trouble or alarm signals.
- 2) Panel reset switch.
- 3) Trouble alarm silence switch with ring back feature.
- 4) Single Zone Detection: Cross zone (optional).
- 5) Battery test meter and switch.
- 6) Manual discharge switch.
- 7) Deadman abort switch.
- 8) Programmable timers for pre-discharge and discharge, 0-60 second cycle.
- 9) Isolated relay contactors for external alarm or equipment and ventilation shutdown.
- 10) Relay contactors for general trouble signal.
- 11) Relay contactor activated by detector zone board in alarm or trouble mode.

3. Operating Sequence:

a. Actuation of one detector in either zone circuit:

- 1) Illuminate zone indicator.
- 2) Energize alarm bell.
- 3) Shut down air-conditioning system and close dampers.
- 4) Signal building fire alarm system via dry contact.

b. Actuation of second detector on second zone circuit:

- 1) Illuminate zone indicator.
- 2) Energize alarm horn.
- 3) Shut down power to protected equipment
- 4) Actuate time delay for up to 30 seconds.
- 5) Release extinguishing agent into protected area.

- 6) If abort switch is engaged, delay release.
 - 7) Upon abort switch disengagement release extinguishing agent unless system cleared and reset.
 - 8) Signal building fire alarm system via day contact closure.
 - c. Discharge of Extinguishing Agent:
 - 1) Sounds alarm bells and horns.
 - 2) Operates strobes.
 - d. Temperature Detection:
 - 1) Lower Temperature: Illuminate indicator and energize bell.
 - 2) Higher Temperature: Shut down power to protected equipment.
- 4. System Abort Switch: The switch shall be a momentary deadman-type, that when depressed, interrupts the automatic sequence of the control system and prevents agent discharge. Each switch shall be permanently labeled "System Abort". These stations shall be located at both emergency fire exits. A contact monitor module shall be included with each switch to give it a specific address (location) through the CCM.
- 5. Verified Detection Sensors:
 - a. The photoelectric sensors shall be spaced and located, in accordance with the manufacturer's specifications and with the guidelines of NFPA 72. In no case shall detector coverage be greater than 250 square feet per detector.
 - b. The system control panel shall provide the command and interrogation signals that confirm an alarm by comparing (with consecutive multiple passes of the "interrogation window") sensor information with stored data on fire conditions. The analog/addressable photoelectric sensor shall provide true linear analog data to the CCM in order for the CCM to differentiate between higher and lower values of smoke density and to establish a working range of sensitivity levels unique to the particular environment. All adjustments needed for sensor sensitivity to meet ambient conditions must have a minimum of 12 levels of adjustment.
 - c. The system shall have the capacity to automatically conduct a weekly functional test of each sensor, that is accomplished by means of a test LED fitted within each sensor. When automatically activated by the control panel this test LED shall produce an infrared signal level directly equivalent to that reflected by a given percentage of smoke entering the chamber. Any sensor not responding to its preset limits shall be automatically readjusted to a programmed level of sensitivity.
- 6. Alarm Signal Outputs:
 - a. Outputs shall be provided from the system control panel for interface with station fire alarm control panel.
 - b. Audible/visual alarm horn/strobes: The alarms shall operate on 24-volt polarized DC power and allow for supervision. The alarm unit shall have a minimum sound level of 97 decibels at 10 feet. All strobes including both in the protected room and outside room, shall be capable of 100 candelas.
- C. Fire Suppression Agent:
 - 1. The agent shall be heptafluoropropane, HFC-227ea. The physical and chemical properties shall conform with the requirements of NFPA 2001.
 - 2. The agent shall be stored in containers, super-pressurized with nitrogen to a maximum total pressure level at 70 degrees F of 360 psig. Higher-pressure agents will not be acceptable.
 - 3. The agent shall have the following characteristics:
 - a. Ozone depletion potential of zero;
 - b. Atmospheric lifetime less than 50 years; and
 - c. 4-hour LC50 > 788,696 ppm
- D. Agent Storage and Distribution Components:

1. Agent Storage Containers:
 - a. Standard model and size for ease of replacement and addition. Design, fabricate, certify, and stamp cylinders in accordance with ASME Section VIII.
 - b. The supply area of agent shall be central storage by design. The storage vessels shall be capable of being refilled in the field and checked for liquid level without the aid of scales or other special tools.
 - c. The supply shall be located as indicated, so that proper hydraulic agent distribution is achieved. Agent storage containers shall be floor mounted and shall include bracket assemblies designed to withstand 1000 pounds thrust for 10 seconds. Floor space is limited, therefore, alternatives requiring more floor space will not be considered.
 - d. The storage containers shall be actuated by means of an electronic initiator. Each container shall be actuated individually. Master/slave solenoid configurations will not be considered.
 - e. Identification: Permanent plate, specifying agent, tare and gross weight, pound of fire extinguishing agent, and pressurization level, installed so plate is visible and readable.
 - f. Cylinder valves: Heavy duty forged brass, incorporating safety release pressure operated manual control, solenoid discharge valve, and pressure gage. Provide solenoid pilot valves for each cylinder or bank of cylinders.
 - g. Manifold: Provide for systems with more than one cylinder with rack to secure each cylinder and check valves between each cylinder discharge and manifold.
 - h. The container and valve shall be capable of releasing the agent as fast as possible and shall in no case exceed 10 seconds.
 - i. A nameplate indicating the manufacturer's name and part number, agent fill weight, and total charged weight shall be permanently bonded to each container.
 - j. Safety Release: Equip cylinder with frangible disk safety device.
2. Actuator: Release of the agent shall be accomplished by an electrical signal from the system control panel in conjunction with a specifically designed agent release module. Systems that employ more than one cylinder shall have all electric initiators connected in parallel.
3. Low Pressure Switch:
 - a. The agent storage container shall be equipped with a low-pressure switch to indicate a loss of container pressure. A decrease in pressure from 360 psi to 275/272 psi will cause the normally closed contact to open, thereby indicating a trouble condition.
 - b. Low pressure switch shall be monitored by the system control panel and shall provide a specific indication of cylinder low pressure.
4. Liquid Level Indicator: Tanks holding in excess of 60 pounds of agent shall contain a liquid level indicator to monitor vessel contents, in addition to the low-pressure switch.
5. Discharge Nozzles:
 - a. Nozzles shall distribute the agent throughout the protected area. Single nozzle shall not discharge more than 250 pounds of agent.
 - b. The nozzles shall utilize a 180 or 360-degree pattern and shall be designed to direct the discharge of agent parallel to the ceiling, thus minimizing the possibility of disturbance to objects within the room.
 - c. Construction: One-piece chrome plated brass or aluminum nozzle with textured finish with female pipe thread integral on body. Direct discharge parallel to ceiling.
 - d. Identification: Permanently mark nozzles to show equivalent single orifices diameter.

2.04 SIGNS AND IDENTIFICATION

- A. Provide signs and identification in conformance with NFPA 2001.
- B. Provide signs and identification to each valve required to be identified.
- C. Provide engraved nameplates for all manual discharge stations and abort switch locations to indicate their function. All alarm devices shall have similar identification plates.
- D. Each entrance door shall include a caution placard indicating that the area is being protected by a clean agent fire suppression system.

2.05 PIPE, FITTINGS, WIRE, AND CONDUIT

- A. Pipe and Pipe Fittings:
 - 1. Pipe and pipefittings shall conform with the requirements of NFPA 2001. Provide pipe with no burst pressure less than 600 psig operating pressure.
 - 2. The method of joining pipe shall conform with applicable requirements of NFPA 2001.
 - 3. Hangers and bracketing shall conform with seismic zone 4 requirements.
- B. Wire and Conduit:
 - 1. Wire: No. 14 awg copper wire conforming with the requirements of Section 16050 with insulation rating of 300 volts and temperature rating of 105 degrees C. Provide power limited fire protective signaling cables conforming with the NEC.
 - a. Unavoidable splices shall be crimp-connected. Wire nuts are not acceptable.
 - 2. Conduit: EMT conduit, fittings, and accessories conforming with the requirements of Section 16050.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Installation Standards: Comply with applicable requirements of NFPA 2001.
- B. System Installation Requirements: The fire suppression system shall be installed by the manufacturer or its authorized representative as indicated and in accordance with the approved Shop Drawings and the manufacturer's installation instructions and recommendations.
- C. Electrical Wiring:
 - 1. Wiring shall be installed in EMT conduit, except that steel flexible conduit may be used for short runs where necessary for movement of devices.
 - 2. Wiring shall be installed to conform with the requirements of the NEC for Class 1 Signal Systems, except as otherwise permitted for limited energy circuits, as specified in NFPA 72.
- D. Securely support piping (in accordance with ASME B31.1) with allowance for fire extinguishing agent thrust forces, and thermal expansion and contraction.
- E. Use grooved mechanical couplings and fasteners only in accessible locations. Roll groove piping only.
- F. Install unions downstream of valves and at equipment or apparatus connections.
- G. Identify in accordance with NFPA 2001 requirements. Place directional arrows and system labels wherever piping changes direction and minimum 20 feet (6 m) on straight runs.
- H. Secure cylinders. (Where manifolded, mount and support by rack. For each system provide same size cylinders containing equal amounts of liquid).
- I. In rooms with suspended ceiling tiles, clip or retain tiles within 4-foot (1.2 m) radius of the nozzles to prevent lifting during discharge.
- J. Install wiring in accordance with Section 16050.
- K. Make final connections between equipment and system wiring under direct supervision of

factory trained representative of manufacturer.

- L. Install engraved plastic instruction plate, detailing emergency procedures, at control panel and at each manual discharge and abort switch location. At control panel identify control logic units, contacts, and major circuits with permanent nameplates.
- M. At hazard area walls pack space between pipe, pipe sleeve or surface penetration with mineral fiber with elastomer caulk to depth 1/2 inch (13 mm). Provide escutcheons where exposed piping passes through walls, floors, and ceilings. Seal pipe penetrations of fire separations.
- N. Locate discharge nozzle approximately 6 inches (150 mm) above or below ceiling and 6 inches (150 mm) below raised floors. Avoid interference with other piping and equipment.
- O. Locate remote manual releases at one or more doors to protect area where indicated. Locate deadman abort switch adjacent.
- P. Locate strobe units at all points of entrance to protected area.
- Q. Locate abort station at all points of exit from protected area.
- R. Ream pipe and tube ends. Remove burrs. (Bevel plain end ferrous pipe.) Remove scale and dirt on inside and outside before assembly. Blow out pipe before nozzles or discharge devices are installed.
- S. Route piping in orderly manner, concealed, plumb and parallel to building structure, and maintain gradient. Install piping to conserve building space, and not interfere with use of space and other work.

3.02 PAINTING

- A. Except where indicated otherwise, piping systems shall not be painted.

3.03 IDENTIFICATION

- A. Apply or install signs and identification in accordance with the requirements of this Section.

3.04 TESTS

- A. System Tests: Tests shall demonstrate that the operation and installation requirements of this specification have been met. Submit certified copies of tests as specified in Article 1.06.G herein.
- B. Functional Tests: Tests shall demonstrate that the entire control system functions as designed. All circuits shall be tested including automatic discharge, manual discharge, and equipment shutdown and alarm devices. In addition, supervision of each circuit shall be tested.
- C. Design Review Test: Take field measurements of the room, and field calculate the amount of clean agent required to reach the design criteria, and match against the contents of the clean agent storage containers.
- D. Pressurization Test: Conduct a door fan test to determine the overall containment capacity of the clean agent protected area, and equivalent leakage area of the room. The calibrated fan unit shall be used to pressurize or depressurize the area with all air conditioning shutdown and dampers closed, and monitor airflow versus pressure data. The results shall be used to calculate a pass or non-pass conclusion. A manufacturer-approved testing unit and program shall be used for this test.
- E. Piping Test Review: Make a field verification of the piping network and match against the flow calculations. All significant variations will require recalculation of the piping system.
 - 1. A distribution piping and valve, prior to nozzle installation pressurization test shall be conducted that requires 150 psi to be held for 10 minutes with no more than 10 percent pressure drop. Inspect joints using soap water solution or halide torch or lamp, replace

and retest.

2. A "puff" test using dry nitrogen shall be conducted. Caps shall be placed over all discharge nozzles and adequate pressure shall be supplied to demonstrate that all of the caps will blow off indicating that the pipes are free of obstructions.
3. Upon completion of installation provide final checkout inspection by factory-trained representative of manufacturer to ascertain proper system operation. Leave system in a fully commissioned and automatic readiness state with circuitry energized and supervised.
4. Submit original copies of tests, indicating that factory trained technical representatives of the manufacturer have inspected and tested systems and are satisfied with methods of installation, connections and operations.

3.05 TRAINING AND INSPECTIONS

- A. Training Requirements: Provide complete system operation training of at least four hours.
- B. Fire Suppression System Inspections:
 1. Provide two inspections of the system during the one-year warranty period. The first inspection shall be six months after system acceptance and the second after 12 months. Inspections shall include the determination of agent container weight and pressure and that the mechanical systems are in proper working order.
 2. Inspections shall also include a complete checkout of the control and alarm system and test, if possible that all interlocking systems are functioning properly.
 3. Documents certifying satisfactory system conditions shall be submitted upon completion of each inspection.

END OF SECTION

HEATING, VENTILATION AND AIR CONDITIONING

SECTION 15800

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this Section.
- B. Refer to Basic Materials and Methods Section 15050 which shall apply to work in this Section.

1.2 DESCRIPTION OF WORK

- A. The work to be done under this Section includes the furnishing of all labor, tools, materials, equipment and services necessary for and reasonable incidental to the installation of complete air conditioning and heating and ventilation equipment as shown on plans and herein specified, excepting only work and/or materials indicated as being done and/or furnished under other sections.
- B. Contractor shall refer to other Sections of the Specifications which may be applicable to or associated with this Section.

1.3 RELATED WORK SPECIFIED IN OTHER SECTION

- A. Electrical Section will provide all power wiring including furnishing and installing of disconnect switches where specified. Control wiring for air conditioning equipment shall be provided by Building Automation and Temperature Control Contractor.
- B. Other Sections will provide and install structural supports for equipment. These supports must be checked and coordinated by this Section so that they suit the equipment which is to be supported.
- C. Other Sections will provide all platforms slabs, lintels and curbs, as directed by this Section, to accommodate the mechanical equipment.
- D. Mechanical Contractor shall provide starters for motors furnished under this Section.

1.4 QUALITY ASSURANCE

- A. These specifications with accompanying drawings, require complete apparatus, fully erected and in successful operating condition. Perform all work in best, most substantial manner.
- B. All equipment furnished and installed under this Section shall be U.L. or E.T.L. approved and labeled where applicable.

- C. All unfired pressure vessels furnished under this Section shall be ASME and National Board stamped.
- D. All manufacturers products shall comply with the requirements of this Section.
- E. Employ qualified sheet metal workers in accordance with SMACNA Duct Construction Standards.
- F. Qualify welding/brazing process and welder/brazer performance in accordance with AWS B2.2, Standard for Brazing Procedure and Performance Qualification, or ASME Boiler and Pressure Vessel Code, Section IX (See 15050). Provide copy of certification for welding and brazing processes.
- G. Soldering processes shall conform to ASME B 31.3, Process Piping and Copper Development Association recommended practices.

1.5 SUBMITTALS

- A. Contractor, before beginning work, shall submit dimensional shop drawings (in accordance with requirements of Division 1), for approval, for all duct systems. Contractor is responsible to coordinate all plumbing, piping, sprinkler, ductwork and electrical to avoid all conflicts. Conflicts encountered after work has started will be corrected at Contractor's expense.
- B. Where the equipment installed is of a different configuration and/or size than that shown on the drawings, Contractor shall assume all responsibility to conform with the intent of the contract documents. The Architect shall be advised of any changes and deviations for his approval. The same shall be true for any field modification required because of "on job" construction conditions.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES, REGISTERS AND LOUVERS

- A. All sizes shall be as indicated on drawings.
- B. All outlets shall be balanced to obtain specific air quantities free of all objectionable draft and noises.
- C. Diffusers, grilles and registers shall be of normal commercial grade as indicated on Schedule on drawings.
- D. Louvers shall be as scheduled and/or detailed on drawings.

2.2 FIRE DAMPERS

Fire dampers shall be solid sheet curtain type, dynamic closure type corrosion resistant galvanized steel construction. Dampers mounted in the horizontal position shall be closed by a

stainless steel negate spring. Damper to be easily reset through standard access panel for required periodic maintenance. Access panels are required for access to all fire dampers, minimum size 12 X 12 inches. Dampers shall be 100% out of air stream. Provide fusible links rated at 160 degrees F.

2.3 ACCESS DOORS

Access doors shall be installed in ductwork wherever required for ready access to any operating part. Doors shall not be smaller than 12 X 12 inches, with brass hinge and sash type fasteners. Ducts 30" or larger shall be supplied with minimum 18 X 18 inch access doors. Doors shall be double wall insulated type, hinged with sash locks and gaskets.

2.4 FANS AND OUTSIDE AIR INTAKES

- A. Size and quantity shall be provided as indicated on drawings.
- B. All roof exhaust fans and roof outside air intakes shall be provided with factory prefabricated curbs.

2.5 HVAC DUCTWORK

- A. Provide and install a complete system of ductwork as herein specified to include, but not limit to supply, return, exhaust and fresh air with grilles, registers, diffusers and appurtenance to provide a complete functional and operational system. Duct sizes shown on drawings are free area dimensions. Design shall be as described in the latest edition of SMACNA manuals and as per the following:
 - 1. Galvanized sheet metal shall be lock form quality per ASTM A653 with a G90 zinc coating.
 - 2. Outside air and exhaust air ducts shall be galvanized sheetmetal with air-tight seams and as per applicable sections of SMACNA manuals for low velocity ducts. Insulate outside air and exhaust air ducts with internal liner if rectangular duct or external wrap if round duct as per SECTION 15250.
 - 3. Supply and return ducts for low pressure system and, low velocity systems shall be galvanized sheetmetal with airtight seams and as per applicable section of SMACNA manuals for low velocity ducts. All ducts shall be insulated with 2" exterior wrap as per Section 15250.
 - 4. Rectangular ductwork for medium pressure, high velocity systems shall be galvanized sheetmetal with airtight seams and as per applicable section of SMACNA manuals for high velocity ductwork. Insulate with 2" exterior duct wrap as per Section 15250.
 - 5. Round rigid ductwork shall be all round single wall spiral pipe and fittings, galvanized steel, as per applicable sections of SMACNA manuals for high velocity duct. Insulate with 2" exterior duct wrap as per Section 15250. Seal all seams, joints and wall penetrations with hardcast as herein specified.

6. All ducts shall be sealed per SMACNA Seal Class A. All joints, longitudinal seams and wall penetrations of all supply, return outside air and exhaust ducts shall be sealed with an elastomeric tape which shall consist of a pressure sensitive layer of modified butyl rubber sealer laminated to a foil backing material which shall conform to surface variations and irregular areas and shall not harden crack or peel. The sealant shall be waterproof and shall be a minimum of 15 mils thick. All ductwork shall be cleaned and prepared and sealant shall be applied strictly in accordance with manufacturer's instructions and recommendations. Sealant shall be Hardcast FG-1402, Suretape #653 or approved equal, at Contractor's option flanged gasketed duct system may be used for POSITIVE PRESSURE SYSTEM ONLY.
 7. Flexible round duct where indicated on plans shall be listed by Underwriters' Laboratories, Inc., under UL-181 standards as Class I flexible Air Duct Material complying with NFPA Standards 90A. Ducts shall be rated on maximum pressure of 6 inches WG positive and 2 inches WG negative. The duct shall be factory fabricated assembly composed of: an inner duct of woven and coated fiberglass providing an air seal and bonded permanently to corrosion resistant coated steel wire helix: a 2" thick fiberglass insulating blanket and low permeable outer vapor barrier of fiberglass reinforced metalized film laminate. Pressure drop not to exceed .15" SP at 500 Fpm through 6" or larger duct. Maximum length of flexible duct shall not exceed 8'-0". Connect flexible round duct with 1/2" wide nylon positive locking nylon straps on inner duct and outer duct.
 8. Splitter dampers shall be installed where branches take off of main trunk ductwork, where ducts divide or where shown on the drawings. Splitters shall be fitted with nickel plated damper regulators in finished areas. Splitters shall be factory fabricated in accordance with SMACNA Duct Construction Standards.
- B. Flexible connections shall be provided between each fan unit and ductwork on supply side and also on return side. Material shall be flexible fire-resistive material, minimum 4" wide, UL listed, with no metal to metal contact.
- C. Duct supports for rectangular ducts shall be a minimum 1" X 18 gauge galvanized steel bands. Hanger bands shall be bent under lower corners and secured with self-tapping screws at corners and six (6") inch intervals up the sides. Distance between hangers shall be as recommended by SMACNA manual for low and medium ductwork. Ductwork shall be rigidly supported to prevent vibration. Duct attachments to structure, lower hanger attachments, ducts traps and rods and trapeze angles shall be in accordance with SMACNA Low Pressure and High Pressure Duct Standards.
- D. Where the ducts pass through walls, draft stops or partitions, the space shall be packed with non-combustible materials, filling all voids around duct.
- E. Fire dampers with fusible links shall be installed at all points in ductwork where indicated on drawings, and/or as required by NFPA, 90-A, AND MECHANICAL CODE OF THE IBC.
- F. Provide radius elbows unless specifically indicated otherwise or space prohibitive. Rectangular radius elbows shall be factory fabricated with a centerline radius of not less than the width of the duct. Round duct elbows shall have a minimum center line radius of 1-1/2 times the diameter of the duct and shall be smooth where possible. Provide square elbows

where indicated or space prohibits the use of radius elbows. Square elbows shall be factory fabricated with double thickness airfoil turning vanes pre-assembled and securely attached to runners.

- G. In general, vertical risers and other duct runs, where the method of support specified above is not applicable, or not specifically detailed on drawings, shall be supported by substantial angle brackets designed to meet field conditions, installed to allow for duct expansion and approved by Architect.
- H. Provide exposed operators for operation of dampers and splitters in inaccessible ceilings, operators shall be chrome plated.
- I. Maximum duct leakage shall be +/- 5%, SMACNA Seal Class A. Supply air, outside air, return air and exhaust air systems shall be designed for 1.0" static pressure. Construct ductwork in accordance with SMACNA Duct Construction Standards for the specified pressure class.
- J. Install Automatic dampers, airflow stations and other duct mounted devices.
- K. Flanged gasketed exhaust and return ductwork will not be accepted.
- L. Dust collection ductwork shall be single wall paint grip galvanized spiral pipe with gauge as follows:

3" to 5"	24 gauge
6" to 11"	22 gauge
12" & larger	20 gauge

All fittings shall be factory made 20 gauge paint grip galvanized steel. Changes in direction shall be made with stamped radius elbows.

End cap cleanout plugs shall be located at the end of each branch and main duct run. Manual blast gates shall be provided for each equipment drop. They shall be full blast gates with aluminum casting and galvanized steel slide blade.

Provide access doors at 10' intervals in duct system. Access doors shall be press formed with double locking nut/spring mounting and polyethylene gasket.

Ductwork shall be connected by use of 20 gauge galvanized steel couplings and supported at 10' intervals and at each equipment take-off (both sides) with 12 gauge steel hangers. Hangers to be supported from structure above with 2-3/8" threaded rods.

Provide a 6" floor sweep where indicated on the drawings.

2.6 PIPING AND PIPING IDENTIFICATION

All piping at each piece of equipment shall be stencil to show the service and direction of flow. Stencils shall be black on a white background with letters one (1") inch high spaced at approximately forty-eight (48") inches apart by equipment or 10 foot intervals along piping runs.. Pressure-sensitive pipe markers ANSI Standard A 13.1 may be used in lieu of stenciling.

2.7 VRF HEAT PUMP SYSTEM (HEAT RECOVERY)

SYSTEM DESCRIPTION

The heat pump VRF system shall consist of an outdoor unit, indoor units and controls by the equipment manufacturer. All conduit, wiring, controls, boxes, refrigerant piping, fittings, valves etc. shall be provided for a complete system in accordance with manufacturer's requirements.

QUALITY ASSURANCE

- A. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Organization for Standardization (ISO).
- B. All wiring shall be in accordance with the National Electrical Code (NEC).
- C. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

STORAGE AND HANDLING

- A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, lifted, etc. as suggested by the manufacturer.

WARRANTY

VRF equipment shall be warranted by the manufacturer's limited warranty for a period of one year from date of installation or 18 months from date of delivery whichever is shorter. An extended warranty including 5 additional years parts and labor shall be granted upon submission to the manufacturer and acceptance by the manufacturer of proper installation with documentation including:

- 1) Selection output and layout of the VRF system.
- 2) 60 minutes of operational history upon commissioning from the VRF service tool.
- 3) Completed commissioning report as per the VRF equipment manufacturer. During this period, any part failing to function properly due to faulty workmanship or material shall be repaired or replaced at the VRF equipment manufacturer's discretion and shall not include labor.

The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent.

Commissioning shall be performed by the manufacturer or certified manufacturer's agent.

HEAT RECOVERY UNITS FOR SIMULTANEOUS HEATING AND COOLING SYSTEMS

- A. General:
 - 1. Heat recovery units shall be designed for use with VRF equipment of the same manufacturer.
 - 2. Heat recovery units shall have factory installed control boards that interface to the VRF equipment controls system and shall perform all functions to effectively and efficiently control the simultaneous heating and cooling VRF system.
 - 3. Heat recovery units shall be completely factory assembled, internally piped and wired.
 - 4. Heat recovery units shall be run tested at the factory.

5. Heat recovery units shall be designed for indoor installation.
6. Shall use R410A refrigerant.
7. All refrigerant lines from the outdoor unit to the indoor units shall be field insulated.
8. Heat recovery units shall allow up to 2, 3, or 4 indoor units to be connected.
9. Y-branches between heat recovery units and indoor units shall not be allowed to ensure independent heating and cooling control of each indoor unit regardless of the mode of any other indoor unit connected to that heat recovery unit.
10. Heat recovery units shall be permitted to be piped in series or parallel to minimize material cost and labor.
11. The following piping shall be allowed.
 - a. Series piping of up to 16 heat recovery units
 - b. Indoor units up to 131 equivalent feet of piping length from the respective heat recovery unit
 - c. Indoor units up to 295 equivalent feet of piping length from the first branch
 - d. Indoor units shall not exceed 16 feet above or below the heat recovery unit
 - e. Elevation difference between the highest and lowest elevation indoor unit shall not exceed 16 feet.
 - f. Total indoor unit nominal capacity shall not exceed 160MBh in any series string of 1 to 16 heat recovery units.
- B. Heat Recovery Unit Construction:
 1. The heat recovery unit shall have 2, 3, or 4 ports which can individually accommodate up to one indoor unit not to exceed 48.1 MBh nominal capacity.
 - i. Indoor units greater than 48.1 MBh nominal capacity shall utilize 2 neighboring heat recovery unit ports.
 2. The heat recovery unit housing shall be galvanized steel.
 3. Each heat recovery unit shall contain piping, valves and controls to divert refrigerant for optimum efficiency.
 4. The unit shall house one double spiral tube-in-tube heat exchanger per port of the heat recovery unit.
 5. Heat recovery units shall be internally insulated and not require installation of any condensate drain.
- C. Refrigerant System
 1. R410A refrigerant shall be required for all VRF equipment and components including indoor units, outdoor units, refrigerant piping, valves, Y-branches, heat recovery units, etc. as applicable.
- D. Refrigerant valves:
 1. Each port shall be circuited with two 2-position solenoid valves to control refrigerant flow path.
 2. Isolation valves shall be field supplied and installed for ease of service to the heat recovery unit without evacuating the entire system refrigerant charge.
 - A. Shall be designed for use with R410A
- E. Electrical:
 1. The heat recovery box electrical power shall be 208/230V, 1 phase, 60 Hz.
 2. All units shall be capable of satisfactory operation within +/-10% of nominal voltage.
 3. The heat recovery unit shall be controlled by integral microprocessors from the main control in the outdoor unit.
 4. The control circuit between the indoor units, heat recovery box and the outdoor unit shall be 24VDC completed using a 2-conductor, stranded and shielded cable for the RS485 daisy chain communication.

WALL-MOUNTED INDOOR UNIT

General:

1. Wall-mounted indoor units shall protrude from the wall no more than 7 inches.
2. Shall be designed for use with R410a refrigerant.
3. Shall be installed with heat pump or simultaneous heating and cooling heat pump VRF systems of the same manufacturer.
4. The indoor unit shall communicate with the outdoor unit via RS485 daisy chain communication.

Indoor Unit

1. The indoor unit shall be factory assembled, wired and run tested.
2. The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.
3. The indoor unit shall have
 - a. self-diagnostic function
 - b. auto restart function
4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

Unit Cabinet:

1. The unit casing shall have a pearl white finish.
2. Multi directional refrigerant piping up to four (4) directions shall be standard.
3. Multi directional drain piping up to two (2) directions shall be standard.
4. The indoor unit shall attach to a separate back plate that secures the unit to the wall.
5. Indoor unit casing shall have integral sensor to read wireless handheld remote controller as standard from the factory.

Filter:

1. Return air shall be filtered with a factory supplied removable, washable filter.
2. Shall be furnished as standard with a factory installed plasma filter with no additional external power supply required.

Fan:

1. The indoor fan shall be an assembly with one cross flow fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced.
3. Motor shall have permanently lubricated bearings.
4. In cooling mode, the indoor fan shall have the following settings; Low, Med, High, Power Cool, and Auto.
5. In heating mode, the indoor fan shall have the following settings; Low, Med, High, and Auto.
6. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
7. A manually adjustable guide vane shall be factory installed allowing the ability to control the direction of airflow from side to side for units 15MBh and below.
8. A motorized sweeping guide vane shall be factory installed allowing the ability to control the direction of airflow from side to side for units 18MBh and above.
9. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

Coil:

1. The indoor unit coil shall be nonferrous with louvered fins on copper tubing for maximum efficiency.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. The coils shall be pressure tested at the factory.

4. A condensate drain pan shall be factory installed below the coil.
5. All refrigerant lines to the indoor units shall be field insulated.

Electrical:

1. The indoor unit electrical power shall be 208/230V, 1-phase, 60 Hz.
2. The indoor unit shall be capable of operation within voltage limits of +/-10% rated voltage.

Controls:

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain. Units shall be provided with wireless handheld remote control for system control

4-WAY CEILING CASSETTE INDOOR UNIT

A. General:

1. Four-way ceiling cassette indoor units shall recess into the ceiling and mount flush.
2. Shall be designed for use with R410a refrigerant.
3. Shall be installed with heat pump or simultaneous heating and cooling heat pump VRF systems of the same manufacturer.
4. The indoor unit shall communicate with the outdoor unit via RS485 daisy chain communication.
5. Shall be rigidly constructed using a decaweb base plate.
6. Provide outdoor air kit for units as indicated on the drawings.

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested.
2. The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.
3. The indoor unit shall have
 - a. self-diagnostic function
 - b. auto restart function
4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

C. Unit Cabinet:

1. The four-way ceiling cassette cabinet shall be designed to recess into the ceiling.
2. The cabinet panel shall have provisions for a field installed, pressurized and filtered outside air intake.
3. Branch ducting shall be allowed from cabinet following manufacturer recommendations.

D. Grille:

1. Four-way grille shall be fixed to bottom of the cabinet and allow two, three or four-way air flow.
2. Grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space.
3. The indoor unit vanes shall have 6 fixed positions
4. The indoor unit vanes shall be capable of automatically swinging the vanes up and down for uniform air distribution. Vanes shall also be capable of being stopped at any position during swing operation.
5. The indoor unit shall have a setting in the heating or cooling mode that shall cycle the vanes up and down to evenly heat or cool the space.
6. Four-way ceiling cassette grille shall have integral sensor to read wireless handheld remote controller as standard from the factory.

E. Filter:

1. Return air shall be filtered with a removable, washable filter.

2. Shall be furnished as standard with a factory installed plasma filter with no additional external power supply required.
- F. Fan:
1. The indoor fan shall be an assembly with one turbo fan direct driven by a single motor.
 2. The indoor fan shall be statically and dynamically balanced.
 3. Motor shall have permanently lubricated bearings.
 4. In cooling mode, the indoor fan shall have the following settings; Super Low, Low, Med, High, Power Cool, and Auto.
 5. In heating mode, the indoor fan shall have the following settings; Super Low, Low, Med, High, and Auto.
 6. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
 7. The indoor unit shall have DIP switches that can be set to provide optimum airflow based on ceiling height.
- G. Coil:
1. The indoor unit coil shall be nonferrous with louvered fins on copper tubing for maximum efficiency.
 2. The tubing shall have inner grooves for high efficiency heat exchange.
 2. The coils shall be pressure tested at the factory.
 3. A condensate drain pan shall be factory installed below the coil.
 4. All refrigerant lines to the indoor units shall be field insulated.
- H. Condensate Pump:
1. The unit shall include a factory installed condensate pump that will be able to raise drain water 27 inches above the ceiling cassette face.
- I. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 Hz.
 2. The indoor unit shall be capable of operation within voltage limits of +/-10% rated voltage.
- J. Controls:
1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

2.7 PIPING AND FITTINGS

- A. Furnish and install all piping related to air conditioning systems including refrigerant piping, air conditioning condensation drains, and other miscellaneous piping.
- B. All piping shall be installed parallel and square with building lines and shall be sloped to permit drainage, with suitable provision for drainage at all low points.
- C. Piping shall be arranged to maintain headroom and keep passageways clear and where necessary shall be offset to maintain the required clearance and conform with the structural features of the building. Contractor shall determine in advance of construction locations for all piping sleeves, hangers, etc. No allowance will be made for extra due to inaccurate location of sleeves, piping or equipment.
- D. All piping shall have provisions for expansion and contraction with anchorage at each point shown on the plans and/or as required.

- E. Full length pipe shall be used where possible, short lengths and couplings will not be permitted. After cutting, all pipes shall be reamed out to full bore and before erection, all cutting and foreign matter shall be removed from the inside of pipes. Screwed joints shall be made tight without caulking or the use of lead or paint and no lubricant shall be used except flake granite and cylinder oil paste, or approved pipe compound applied to make threaded pipe.
- F. Pipe sleeves shall be provided for the passage of all pipe through walls, floors and partitions.
- G. All condensate drain piping shall be installed using ASTM B88 type "L" hard drawn copper with wrought copper sweat fittings. Changes in direction of piping shall be made with short turn tee pattern or 45 degree wye fittings with brass cleanout plug. Insulate drain piping, minimum drain on fan coil units – 3/4", air handling units – 1-1/4".
- H. Refrigerant piping shall be type ACR hard drawn copper wrought copper sweat type fittings and silfos solder. Provide a catch-all liquid line strainer and a liquid line moisture indicator sight glass at each condensing unit. Strainer shall be installed in a three valve by-pass. Completely evacuate system before providing refrigerant operating charge as recommended by equipment manufacturer. Pipe sizes shall be as recommended by equipment manufacturer for installation shown. Insulate per Section 15250.

2.8 100% OUTSIDE AIR UNIT (DOAS)

A. General

Factory-assembled, the unit consists of fan and motor assemblies (supply and exhaust), all necessary dampers, plenums, filters, drain pans, wiring, controls and other accessories as specified. Unit shall be stand-alone controlled with all control devices provided by the manufacturer. Equipment shall be warranted (parts and labor) by the manufacturer for 3 years from the date of final project acceptance.

B. Unit Cabinet

1. Unit is to be installed by the mechanical contractor.
2. All unit panels are attached with zinc plated hexagonal-head type screws complete with a washer and rubber gasket for weatherproof assembly. All panel seams shall be caulked and sealed for an airtight unit.
3. When rigging, base frame deflection shall be less than 1/360 of the unit length. All major components shall be supported by the base without sagging or pulsating.
4. Unit base shall be constructed from structurally formed galvanized steel (6").
5. Unit base shall accommodate curb or concrete pad installation. Single wall and non-insulated floor construction is not acceptable.
6. Unit base shall be internally insulated with 4", 3.5 lb/cu. ft. mineral wool (R16.8).
7. Single wall construction with coated insulation is not acceptable. Exposed insulation edges in the airstream are not acceptable.
8. Unit floor shall be constructed from 16 or 18 gauge galvanized steel. Unit sub-floor shall be constructed of 26 gauge galvanized steel.
9. The rigid frame provides stable construction allowing for panel removal without affecting the unit integrity.
10. Panels shall be double wall construction using 2" thick mineral wool insulation (R8.4), galvanized steel painted exterior panels and galvanized steel inner liners.

11. Internal partition shall be insulated and constructed in the same manner as the unit cabinet.
12. Double-sloped IAQ drain pans shall be made of formed sections of stainless steel. Drain pans shall be sloped at a minimum of 1.5% with a drain pipe connection of 1 1/4" MPT ending over the structural base channel. All drain pan corners shall be welded

C. Access Doors

1. Full size access door(s) allowing for periodic maintenance and inspections must be provided for all serviceable components. Door insulation shall be the same as unit panels. Doors shall be provided with heavy duty corrosion resistant aluminum hinges that allow doors to open at 180° with no shear effect on the full perimeter gasket on the hinge side. *Doors shall be double wall construction made of galvanized steel for both outer and inner liner for maximum rigidity. Door frames shall be extruded aluminum with a built-in thermal break barrier and full perimeter gasket.*
2. Compression type handles operable from both sides and neoprene resilient bubble gaskets for a seal-tight enclosure shall be provided.
3. Door openings shall be flush with all surrounding panels.

D. Fans

1. Fans shall be factory-tested and performance ratings shall comply with AMCA 210.
2. Fans shall be statically and dynamically designed and balanced for continuous operation at the maximum rated fan speed and motor horsepower in accordance with AMCA 300.
3. Fans shall be of centrifugal type, rigidly braced and reinforced to help prevent vibration or pulsation. Wheel diameters and outlet areas shall be in accordance with the sizes adopted by AMCA.
4. Fan and motor assemblies shall be mounted inside the unit casing with 1" [25mm] (90% minimum efficiency) deflection spring vibration isolators and supplied with flexible neoprene connections.
- Fan and motor assemblies shall be mounted inside the unit casing with 1" deflection spring isolators with or without seismic restraint.
5. Removable shipping restraints shall be provided to protect the fan, motor and base during shipment.
6. Fan shall be selected for stable operation, at least 20% under the first critical speed of the fan.
-Unit shall be equipped with non-overloading, Class 2 plug fan
7. Fan shaft shall be solid steel, turned, ground, polished and finished off with a corrosion resistant coating. Fan wheels shall be keyed to the shaft.
8. Bearings shall be heavy duty, grease-lubricated, self-aligning ball or pillow block type, selected for a minimum average bearing life (L-50) in excess of 200,000 hours at maximum operating speed in accordance with AFBMA 9 Standards.
9. Fan drives shall be designed for a 1.3 service factor. Drives are factory-mounted with final alignment and belt adjustment completed before unit start-up.
10. Motors and fan pulleys shall be of fixed pitch.
OPTIONS: *- Fan shall be equipped with adjustable motor sheave (for motors up to 10 HP).*
- Fan belt guard shall have holes for tachometer.
- Units shall be equipped with extended lubrication lines with PVC or copper

tubing mounted on the fan assembly access side.

E. Motors

1. All motors are enclosed in the unit casing and are mounted on an adjustable base that allows for belt alignment and tensioning.
2. Fan motors shall be heavy duty, 1800 rpm, high efficiency (EPAct), open drip proof (ODP), NEMA Design B with Class F insulation and have a 1.15 service factor.
3. Fan motor torque shall efficiently accelerate the drive loads.
4. Motor shall be of minimum size as indicated in the equipment schedule. Unless indicated, motor shall not operate in the service factor range.
 - *Fan motors shall be premium efficiency.*
 - *Fan motors shall be inverter duty.*
5. Temperature rating shall be 122°F [50°C] maximum temperature rise at 104°F ambient for continuous duty at full load (Class B Insulation).
6. Motor construction shall be to NEMA Standard MG 1, general purpose, continuous duty, Design B.
 - a) Base shall be adjustable.
 - b) Bearings shall be:
 - i) Ball or roller type with inner and outer shaft seals.
 - ii) Grease lubricated.
 - iii) Designed to resist thrust loading where belt or other drives produce lateral or axial thrust in motors.
 - c) Energy efficient motors shall have a minimum efficiency in accordance with IEEE Standard 112-B. If efficiency is not specified, motors shall give a higher efficiency than "average standard industry motors" in accordance with IEEE Standard 112-B.

F. Filters

1. Filters shall be of UL 900 Class II.
2. Outside and return air inlets shall be equipped with galvanized steel racks that permit filter slide out removal (side access) for units equal or less than 78" tall and universal holding frames with upstream access for units taller than 78".
 - *Outside and return air inlets shall be equipped with universal holding frames with upstream access.*
3. Filter air velocity shall not exceed 500 fpm through each filter bank.
4. Unit shall include 2" disposable-type air prefilters, MERV 8.

G. Electric Heater

1. Coils shall be of a high-grade nickel-chrome alloy and shall be insulated by floating ceramic bushings from the galvanized steel frame. Coil terminal pins shall be stainless steel insulated by means of non-rotating ceramic bushings.
2. All heaters shall be equipped with a fail-safe, automatic reset and a disc-type thermal cut-out.
3. Cut-outs shall be shielded from accidental impact and shall de-energize the heater in the case of insufficient airflow.
4. Heater shall be equipped with protective screens on both sides of the coils for maintenance and safety purposes.
5. Load fuses shall be supplied.

6. Electric heater shall have pressure electric switches and manual reset thermal cut-out.
7. Duct heaters shall be completed with the following built-in controls: high limit cut-outs, magnetic contactors (as required), control transformers and airflow sensors.
8. Electric heater shall have SCR controller staging (100% proportional or with sequential stages).

H. Coils - General Information

1. Acceptable coils shall have ARI Standard 410 certification and bear the ARI symbol.
2. Coils shall be submerged in water and tested to a 315 psig air pressure for standard copper tube coils. Coils must display a tag with the inspector's identification as proof of testing.
3. Tubes shall have a nominal thickness of 0.020" [0.5mm] unless otherwise specified.
4. Fins shall be made of 0.0075" thick aluminum unless otherwise specified.
5. Tubing, return bends and headers shall be made of seamless UNS 12200 copper meeting ASTM B75 and ASTM B251 Standards. Coil return headers shall be equipped with factory-installed 1.2" FPT air vent connections placed at the highest point available on the face of the header (except for evaporator coils).
6. Casings and endplates shall be made of 16 gauge stainless steel, meeting ASTM A527 Standard unless otherwise noted.
7. Double flanged casings on the top and bottom of finned height shall be provided to allow for coil stacking.
8. Piping, control valve and valve operator shall be supplied and installed by others.

I. Evaporator (DX) Coils

1. Coils shall be tested to be leak-free with nitrogen at 500 psig underwater. The entire refrigerant piping circuit shall be leak-tested at 150 psig air pressure.
2. Coil tube size and wall thickness is 5/8" x 0.020".
3. Fins shall be made of 0.0075" thick aluminum and mechanically bonded to copper tubes.
4. Standard construction fluid connections are sweat-soldered and constructed of copper.
5. Distributor shall be designed to have a removable nozzle to allow for installing an auxiliary side connection for hot gas bypass.

J. Hot Gas Reheat Coils

1. Coils shall be tested to be leak-free with nitrogen at 500 psig underwater in an illuminated tank.
2. After testing, coils shall be emptied, thoroughly dried and capped.
3. Coil tube size and wall thickness shall be 5/8" x 0.020". Tubes shall be riffled.
4. Fins shall be made of 0.0075" thick aluminum and mechanically bonded to copper tubes.
5. Standard construction fluid connections shall be sweat-soldered and made of copper.
6. Coil shall be multi-circuited as required.

K. Refrigerant Circuits – General Information

1. Entire refrigerant piping circuit shall be leak-tested at 150 psig air pressure.
2. Each unit shall be provided with hot gas bypass on the lead compressor.
3. Refrigerant circuit components shall include: thermal expansion valve, distributor, liquid line filter drier, sight glass and charging valve.

4. Suction and hot gas bypass lines shall be insulated with 3/8" [10mm] thick elastomeric pipe insulation.
5. All refrigerant piping shall be type L or ACR copper.

L. Scroll Compressors

1. Compressor shall be hermetically sealed scroll type with a forced-feed lubrication system and oil charge.
2. Compressor motor shall be refrigerant gas-cooled with inherent internal line break protection and mounted on rubber grommet isolators.
3. Compressor shall be R410a type with suction-cooled motor windings.
4. Compressor shall include internal pressure relief valve, gas sensor and device to limit the shut-down noise caused by scroll reversal.
5. Capacity reduction shall be provided by hot gas bypass on lead compressor.
***OPTION:** - Capacity reduction shall be provided by hot gas bypass on all compressors.*
6. Compressor shall have discharge, hot gas bypass and liquid service valves. Each compressor shall have a crankcase heater that is independently fused and will remain energized at all times unless unit is disconnected at the main power source.
7. Scroll compressors shall be provided with RIS vibration isolators.
8. System shall include external crankcase heater and discharge service valves.

M. Cooled Condensing Section

All refrigerant piping shall be of L or ACR copper type. The complete system shall be factory-dehydrated and pressure-tested prior to being charged with R410a. Each refrigerant circuit shall include moisture indicating sight glass, filter/drier, liquid line isolation valve and externally equalized thermostatic expansion valve.

Condenser Coil

1. Coils shall be tested to be leak-free with nitrogen at 500 psig underwater in an illuminated tank.
2. After testing, coils shall be evacuated, thoroughly dried and capped.
3. Coil tube size and wall thickness is 3/8" x 0.020" standard copper. Use rifled copper tubes.
4. Fins shall be made of 0.0075" thick aluminum and mechanically bonded to copper tubes.
5. A 15°F sub-cooling section shall be an integral part of the condenser coil.
6. Standard construction fluid connections are sweat-soldered and made of copper.
7. Coil shall be multi-circuited as required.
8. Condensing section shall be equipped with solenoid valve.

N. Electrical

1. Unit shall be provided with single-point power connection.
2. Unit shall be equipped with all necessary high voltage components as follows:
 - a) Variable frequency drives on all high voltage motors for constant speed applications.
 - b) Thermal protection on all high voltage motors.
 - c) Fuses and fuse holders.
 - d) All necessary control transformers.
3. All components shall be fully wired and tested prior to shipping.
4. Unit shall be completed with all necessary relays, time delay, damper actuators with auxiliary switches.

O. Controls

1. Control system shall be a factory-mounted stand-alone microprocessor-based DDC, necessary sensors and interfaces to monitor and operate all functions as outlined in the equipment/control schedule or required for complete unit operation (heating, cooling, frost control, damper and sequencing). All controls shall be provided by the Manufacturer. Provide thermostat and humidstat as indicated on the drawings.
2. Control system shall be mounted in the unit main control compartment.
3. Integral control panel shall be provided with a hinged access door and a locking device.
4. Control panel compartment heaters and thermostats shall be provided if control panels cannot be protected from minimum ambient temperatures.
5. All control devices, except those not mounted directly to the unit, shall be factory-mounted and wired. Control panel shall have a labeled strip to connect all wires for field-installed control components.
 - *Control system with necessary sensors and interfaces shall be field-supplied, programmed, mounted, wired and run-tested by the control contractor. The control contractor shall co-ordinate mounting locations and logic with the unit manufacturer.*
 - *Control system with necessary sensors and interfaces shall be customer-supplied, programmed, factory-mounted, wired and run-tested by the control contractor. The control contractor shall co-ordinate mounting locations and logic with the unit manufacturer.*
6. Factory-mounted DDC control system shall be factory-programmed and run-tested prior to shipment to verify functions and logic.
7. A unit-mounted intelligent programmable interface device shall be included for communication, display and setpoint control.
8. A unit-mounted Hand/Off/Auto switch shall be included to allow for servicing.
9. A flow schematic with sensor and component identification and location, sequence of operation and factory setpoints shall be included with submittals. A wiring schematic provided with the unit shall be completed in ladder/logic format with component labeling according to line numbers and a completed bill of materials prior to shipment.
10. The unit shall provide 52 degree F leaving air off the coil in cooling mode. The hot gas reheat shall reheat the air to deliver room neutral air at 70 degrees F. The heating setpoint shall be 70 degrees F.

2.9 FABRIC DUCT SYSTEM

DESCRIPTION OF WORK:

- A. Extent of non-metal ductwork is indicated on drawings and by requirements of this section.
- B. Types of non-metal ductwork required for this project include the following:
 1. Textile Air Dispersion Products.

QUALITY ASSURANCE:

- A. Building Codes and Standards:
 1. Product must be Classified by Underwriter's Laboratories in accordance with the 25/50 flame spread / smoke developed requirements of NFPA 90-A and UL 2518.
 2. All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.
- B. Design & Quality Control

1. Manufacturer must have documented design support information including duct sizing; vent, orifice, and/or nozzle location; vent, orifice, and/or nozzle sizing; length; and suspension. Parameters for design, including maximum air temperature, velocity, pressure and textile permeability, shall be considered and documented.

SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications on materials and manufactured products used for work of this section.
- B. Building Code Data: Submit UL file number under which product is Classified by Underwriter's Laboratories for both NFPA 90-A and UL 2518.
- C. Provide detailed drawings confirming configuration of Fabric Tensioning System (components, support locations, segment lengths) and Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).
- D. Provide detailed installation instructions for components to be installed.
- E. Provide warranty and maintenance documentation.

WARRANTY:

- A. Manufacturer must provide a 20 Year Product Warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

DELIVERY, STORAGE AND HANDLING:

- A. Protect textile air dispersion system and SkeleCore FTS components from damage during shipping, storage, and handling.
- B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

MANUFACTURER:

Subject to compliance with requirements, choose one of the following:

- A. DuctSox® Corporation
- B. KE-Fibertec
- C. Prior approved equal

TEXTILE AIR DISPERSION SYSTEM:

- A. SkeleCore FTS (Fabric Tensioning System): Air diffusers shall be constructed with internal tensioning frame.
 1. System shall cylindrically tension textile along the entire length of textile duct, including all fittings(crosses, elbows, reducers and tees).
 2. Tensioning system shall include full 360 degree tensioning and intermediate rings with quick connection spacer tubes concealed inside the fabric system.
 3. Interior structure to include multiple mechanically adjustable tension devices. To provide proper textile tensioning, structural and textile system shall be configured in segments of no more than 45 feet.
 4. Textile components supported solely by metal cylindrical rings.
 5. Each cylindrical ring shall require a vertical metal to metal cable safety attachment.
 - a. Vertical supports are Galvanized steel with available lengths of 5'(standard), 10', 15', & 30'.
- B. TEXTILE
 1. Sedona-Xm

- a. Textile Construction: Filament/filament twill polyester treated with a machine washable anti-microbial agent by the fabric manufacturer, fire retardant in accordance with UL 2518.
- b. Air Permeability: 2 (+2/-1) CFM/ft² per ASTM D737, Frazier
- c. Weight: 6.8 oz. /yd² per ASTM D3776
- d. Warranty: 20 years with standard inlet velocity.
- 2. Textile Color
 - a. Custom – colors shall be custom and owner shall provide graphic images to include on sections of the duct systems

C. TEXTILE SYSTEM FABRICATION REQUIREMENTS:

1. Textile system to be constructed in modular lengths (zippered) with proper radial securing clips (inlets, endcaps and mid-sections) and top access zippers for vertical cable safety attachment.
2. Integrated air dispersion shall be specified and approved by manufacturer.
 - a. Orifices – 2” & 3” SG’s (Sewn-in Grommets)
 1. Air dispersion and extended throws are accomplished by reinforced orifices and permeable fabric. Reinforced orifices are to be installed to keep the integrity of opening and withstand laundry processes.
 2. Diameter, quantity, and location of reinforced orifices to be specified and approved by manufacturer.
 - b. Fixed Nozzles
 1. Air dispersion accomplished by using conical aerodynamic nozzles and permeable fabric. Diameter of nozzles height to be minimum ½”. Due to exact requirements of throw and maximum level of noise alternative flow models are not acceptable.
 2. Color of nozzles must match color of fabric. Unless otherwise specifically mentioned on drawings or otherwise in this specification, suppliers standard table is used for selection of color.
 3. Location and number of nozzles to be specified and approved by manufacturer.
 - c. Adjustable Nozzles
 1. Air dispersion accomplished by adjustable ball nozzles and permeable fabric. Adjustable ball nozzles to have multiaxial rotation to redirect airflow to desired area. Adjustable ball nozzles are able to completely close off airflow without adding caps or plugs. Adjustable ball nozzles should lock into place once set, preventing constant adjustment. Adjustable ball nozzle should have inset design to be a condensation resistant product.
 2. Colors of adjustable nozzles available are white and black. With white material receiving white adjustable nozzles and all other material colors receiving black adjustable nozzles unless otherwise specifically mentioned on drawings or otherwise in the specification.
 3. Quantity and location of adjustable ball nozzles to be specified and approved by manufacturer.
3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener – supplied by contractor.
4. Inlet connection includes zipper for easy removal / maintenance.
5. Lengths to include required intermediate zippers as specified by manufacturer.

6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
7. End cap includes zipper for easy maintenance.
8. Each section of the textile shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.

D. DESIGN PARAMETERS:

1. Textile air diffusers shall be designed from 0.25” water gage minimum to 3.1” maximum, with 0.5” as the standard.
2. Textile air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
3. System overall design; diameter, length, airflow, operating static pressure and dispersion shall be designed by the manufacturer based on airflow requirements on the drawings.
4. Do not use textile diffusers in concealed locations.
5. Use textile air dispersion systems only for positive pressure air distribution components of the mechanical ventilation system.

INSTALLATION OF TEXTILE AIR DISPERSION SYSTEM:

- A. Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.

CLEANING AND PROTECTION:

- A. Clean air handling unit and ductwork prior to the DuctSox system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
- C. If DuctSox systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

2.10 AIR PURIFICATION UNITS

- A. The air purification system shall consist of an air filtration system and activation system to capture, reduce or eliminate vehicle exhaust products. The unit shall be Air Hawk 3000-XL or approved equal. The system shall be mounted and installed per the manufacturer’s recommendations.
- B. The unit shall consist of a MERV 11 pre-filter, MERV 16 HEPA grade primary filter and a gas-phase filter with a 50/50 blend of activated carbon and potassium permagnate on zeolite.
- C. Photo – Catalytic Oxidation Chamber: The photo-catalytic oxidation chamber shall utilize a grid made of aircraft aluminum honeycomb material with 1/8” cells, 3/4” thick with a minimum of 70 sqft. of surface area. Titanium dioxide shall be impregnated throughout the entire grid. The surface of the grid shall be illuminated with two UV lamps of at least 3milliwatts/CM².
- D. The unit shall have a 16 gauge steel cabinet with holes pre-drilled for the 3/8” support rods. The cabinet shall be powder coated and baked finished. Access doors shall be provided and the unit shall be equipped with 4-way adjustable diffusers.

- E. The motor blower shall be direct drive, forward curved, 1 HP, 208V, single phase, permanent split capacitor motor.
- F. Control Panel: The unit shall have a NEMA 4X control enclosure with start/stop push button, power light/motor overload indicator, diagnostic scree, time boost push button, sequenced motor starting, long range photo-electric, CO/NO₂ monitor, LED filter change.
- G. Unit shall include necessary controls and photo eyes to operate the unit upon opening and closing of any of 4 roll up doors for a timed period of 10 minutes (adj.). System shall also be set for automatic mode where any vehicle passing the photo eye operates the system. Provide all necessary controls, wiring and hardware to operate the system.

2.11 ROOFTOP UNITS

- A. Units shall be rated, factory, internally wired, rooftop heat pumps fully charged with R-410a, 100% run tested at the factory and shall have the capacities and characteristics as scheduled on the drawings. Units shall be UL listed and labeled for single point power connection.
- B. Unit casings shall be constructed of zinc coated, heavy gauge, galvanized steel and the exterior surfaces finished with a weather resistant baked enamel finish. Cabinet construction shall allow for all maintenance to be performed from one side. Service panels shall have sheet metal hinged access doors for access to filter/evaporator, supply fan/heat and the compressor/controls. All exposed vertical panels and top covers in the indoor section shall be insulated with a cleanable foil-faced glass fiber material. The base of the unit shall be insulated with ½ inch, 1 pound density, foil faced closed cell insulation. The unit's base pan shall have no penetrations within the perimeter of the curb except the 1 ½ inch high horizontal supply /return openings. The top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket sealed. Tops shall be sloped to prevent water pooling on unit top. Unit shall be provided with a removable, double sloped drain pan. Unit shall be provided with factory roof curb.
- C. Units shall have 2 inch factory supplied, MERV 13 pleated filters.
- D. Units shall have high efficiency direct drive, hermetic, scroll type compressor with a centrifugal positive oil pump. Motors shall be suction gas cooled. Compressors shall have crankcase heaters, and internal temperature and current sensitive motor overloads. Units shall have compressor staging as indicated on the drawings with 2-stage units where possible.
- E. Each refrigerant circuit shall have a thermal expansion valve, service pressure ports and factory installed lines filter driers. Hot gas reheat and dehumidification control cycle shall be provided.
- F. Evaporator and condensed coils shall be 5/16 inch copper tubes with mechanically bonded aluminum plate fins. Coils shall be leak and pressure tested at the factory before shipment.
- G. The condensed fan shall be direct drive, propeller type, statically and dynamically balanced, draw through in the vertical position. The motor shall be permanently lubricated and shall have built in thermal overload protection.
- H. The evaporator fans shall be FC, belt drive with an adjustable motor sheaves. Motors shall be internal thermally protected.
- I. Units shall be provided with factory installed electric heating elements. Elements shall be constructed of heavy duty nickel chromium elements internally connected and UL or CSA

certified. Each heater package shall have; automatically reset high limit control; heating element contactors; and individually factory fuses meeting NEC and CEC requirements.

- J. Units shall be completely factory wired for electronic microprocessor controls including control transformer and pressure lugs for single point power connection. Controls shall include; a factory provided and wired zone temperature sensor located in the return air; electronic thermostat module that shall interface to the unit microprocessor and control the unit for the desired stages of cooling and heating; phase monitor for the protection of the motors and compressors against phase loss, phase imbalance and phase reversal and shall be equipped with an LED “on or fault” indicator; a dedicated differential pressure switch with zone sensor and indicator lights for active fan failure and/or clogged filter notification; zone sensor control for automatic programmable night setback system malfunction and remote sensor. Each unit shall be provided with a factory automatic changeover night set back thermostat for control operations as here-in-after specified.
- K. Units shall be provided with two-position outside air dampers. Dampers shall be set to the outside air quantities as scheduled on the drawings. Once set the dampers shall open to the set position when the fan starts and close to full closed when the fan shuts down.

2.12 DX SPLIT SYSTEM COMPUTER ROOM UNIT

Standard Features/All Systems

The system shall be a ceiling mounted supplemental air conditioner designed and built to the highest of industry standards. The system shall be complete and factory run-tested before shipment.

Cabinet Construction

The cabinet and access panels shall be fabricated from aluminum for corrosion protection and to minimize the system’s weight. The panels shall be lined with 2 lb/ft² high density sound and thermal insulation and sealed with self-extinguishing gasketing conforming to NFPA 90A and 90B.

Component Access

The air conditioner shall be fully accessible in-place through easily removable side access panels.

Electrical System

The system shall incorporate overcurrent and overload protection in accordance with UL 1995 requirements. Each blower motor, compressor, electric heater stage and humidifier shall be provided with a factory mounted and wired starter / contactor.

The control circuit shall be a 24 VAC Class 2 low voltage circuit including a circuit breaker for protection. Low voltage, high voltage and grounding wires shall be color coded and shall be individually numbered at each end for ease of service tracing. All wiring shall be in accordance with the National Electric Code (NEC).

Overflow Safety Float Switch

A condensate pan water level switch shall be incorporated to shut the system down if an overflow condition is sensed.

Remote Stop/Start

The system shall contain an electrical control circuit that shall be a 2-pin terminal connection for remote stop / start of the air conditioner by a remote source.

Blowers/Motors

Direct Drive Systems

The blower(s) shall be direct driven with double width, double inlet housing and forward curved blades. The blower(s) shall be dynamically and statically balanced to minimize vibration and operate in the Class I range. The blower(s) shall be corrosion protected with a painted housing and impeller wheel.

The three speed (208V) evaporator motor shall be factory wired for the correct speed to produce the specified air quantity. The motor(s) shall have internal overload protection. (277V & 460V direct-drive motors shall be two speeds.)

Temperature & Humidity Control

The standard system shall be configured with heating, reheating and humidity control to provide total space temperature and humidity control.

Air Pattern

Ducted

The air conditioner shall be provided with evaporator supply and return air duct connections.

Filters

Ducted Unit Filters

The unit shall have slide out, 1" deep Class 2 (per U.L. Standard 900) filter(s) in a filter rack mounted inside the air conditioner, in front of the evaporator coil. The filter shall have a rating of at least 80% average arrestance as measured by ASHRAE Standard 52-76 test method.

DX Systems

DX – Coils

Evaporator systems shall be configured for a draw-thru air pattern to provide uniform air distribution over the evaporator coil face. The coils shall be seamless drawn copper tubes, mechanically bonded to tempered aluminum fins with a raised-lanced fin design for maximum heat transfer. Coil end plates shall be hot dipped galvanized. The evaporator coil shall be mounted in an insulated stainless steel condensate drain pan.

DX - Refrigeration System

All refrigeration piping shall be refrigerant grade tubing. Each refrigerant circuit shall include, as a minimum:

- refrigerant drier/strainer
- sight glass with moisture detector
- thermal expansion valve with rapid bleed port feature
- external equalizer
- evaporator coil
- compressor
- high-pressure switch with manual reset

- low pressure switch with automatic reset

Split / Remote systems shall have a liquid line solenoid for refrigerant isolation to prevent liquid slugging. All high-pressure joints shall be brazed, and the entire system shall be pressure tested at the factory with dry nitrogen, evacuated to at least 50 microns and fully charged with refrigerant.

Refrigeration Charge

All split / remote DX systems shall ship with a dry nitrogen holding charge. All self-contained DX systems shall ship with a full refrigerant operating charge.

DX - Scroll Compressors

Each compressor shall be a high efficiency, high-reliability and low sound Scroll Compressor, unless specifically noted otherwise.

The compressor shall be complete with charging and service schraeder ports, internal vibration isolation, internal thermal overloads, internal pressure relief valve, internal discharge gas vibration eliminator and external vibration mounting isolation.

Standard Features/Individual Systems

DX - Air Handling/Condensing Units

DX - Air Handling Unit

The system shall be a ceiling-mounted, supplemental DX-Air Handling Evaporator. The air handling section shall house, as a minimum, the evaporator coil, expansion valve, evaporator blower/motor and associated electrical and refrigeration components.

The evaporator section shall be located at a remote distance from its corresponding outdoor remote air cooled condensing unit. The system's compressor(s) shall be located with the Remote Condensing section.

The air handling unit shall require only single point main power supply connection and the system shall ship from the factory with a dry nitrogen holding charge ready for field refrigerant charging.

DX – Air Cooled Outdoor Remote Condensing Unit

The system shall be an outdoor remote air cooled condensing unit with direct-driven, propeller fan(s). The system's compressor(s) shall be located with the remote condensing unit section. The condensing unit cabinet shall also house the condenser coil, blower and blower motor and outdoor rated electric box.

The condensing unit shall be sized to provide the total heat of rejection of the system at a 95°F DB ambient temperature for the corresponding DX Air Handling Unit.

Control Options

Easy to Read LCD Graphic Display

The control system is a microprocessor-based control system with a backlit LCD alphanumeric display for visual indication of unit operating conditions.

User Interface

The Interface features an easy to read, liquid-crystal alpha-numerical display. The attractive unit mounted interface allows the operator to visually monitor and customize unit functions and settings. The controller is operated via a 6-key menu-driven Windowstm type structure, in five different modes; Information, Alarm Log, Control, Service and Factory.

System Information

The LCD Graphic Display shall indicate current unit functions via symbol identification:

- Cooling
- Heating
- Humidifying
- Dehumidifying
- Heating

Run Times

The maintains actual running hours of all the motor devices and operational cool times. These hours are displayed on demand. This feature assists in maintaining the control equipment in peak condition to minimize down time.

Security

The flexibility, reliability and control offered by the microprocessor are extensive. However, these benefits need to be reserved for operators that understand their proper use. The provides three levels of restricted entry into the configuration options to ensure that the operating parameters are not changed by unauthorized operators.

Level 1 – Basic user operating set points

Level 2 – Operating offsets

Level 3 - Factory settings

Alarm Control

Alarm conditions activate an audible and visual indicator. The alarms are acknowledged through a dedicated alarm key located on the user interface.

The alerts to the following alarm conditions (if applicable):

• High Temperature	• Dirty Filter
• Low Temperature	• Smoke Detection
• High Humidity	• Firestat
• Low Humidity	• Leak Detection
• High Head Press	• Sensor Failure
• Low Suction Press	• Comm. Failure
• Loss of Air Flow	

Upon the receipt of any alarm, the alarm condition is displayed along with suggested operator actions to be taken. An audible tone and red LED is presented at time of the alarm occurrence.

Alarm History

The controller provides users with a recorded history of the last 50 alarms, including the time and date of the alarm.

Set points

User adjustable set points are available for temperature, humidity, control deadbands, high temperature alarm, low temperature alarm, high humidity alarm and low humidity alarms, EC fan speed, and economizing control are made through the Control menu.

Power Loss - Restart

The controller can be configured for Automatic or Manual Restart after a power failure event. The non-volatile memory enables the system to restart when power is restored, without the loss of any stored set points or other system configuration settings.

Sequential Activation

To minimize the total inrush current loads during system startup/restart, the controller is configured for time-delay sequence startup. The user can designate electric heater, EC fans and/or humidifier restart delays. The unit restart delay can be adjusted from 0 to 999 seconds.

Recovery Delay

After a power loss, the Recovery Delay feature allows the Precision A/C to operate without initiating any high or low temperature or humidity alarms for a delayed period. This feature allows the time (15 to 60 minutes adj.) to "pull-down" the conditioned space's load without nuisance alarms during startup or power loss restart.

Cooling Inhibit Feature

All cooling functions are inhibited in the event that the temperature drops 4°F below the setpoint during dehumidification. This temperature can be adjusted by the user. Cooling functions are automatically restored once the temperature returns to the set point.

Nonvolatile Memory

The controller is equipped with a nonvolatile memory that retains the current configuration and alarm status in the event of a power loss. The operating program and control parameters are saved to FLASH-MEMORY ensuring they are stored in the event of power failures.

Internal Clock / Date

The controller is equipped with an internal clock and date function with battery back-up.

Field Programmable

The microprocessor can be field programmed for all control configurations to match the unique needs of any data center, telecommunications or other critically defined areas.

System of Units (I-P)

The controller allows for the display of intermixed Metric and I-P properties.

Common Alarm Output

The controller has one (1) available non-powered dry contact that will activate if an alarm was configured to activate the common contact. The contact closes upon the receipt of the alarm and opens when the alarm condition has been cleared.

Assignable Common Alarm Output

The controller has one (1) available non-powered dry contact that will activate if a user configured alarm was programmed to activate. The contact closes upon the receipt of the alarm and opens when the alarm has been cleared.

Inherent Fail Safe Mode

The controller software is equipped with an operational fail safe mode. Upon a return air or supply air sensor failure, all EC fans will increase to the maximum fan speed setting and the chilled water valve will default to 100% open.

In the event of a BAS monitoring/control signal failure, the controllers will default to local operation at present set points for the fan, external economizer damper and chilled water valve control. The local sensors have priority over the BAS system.

Building Communication Interface

Inputs & Outputs shall be remotely monitored (address readable) and remotely controlled (address writable) via a building management system (BMS) / local area network (LAN) control system that can communicate via BACnet Ethernet, and BACnet over IP, maximum 320 ft, 10 Base T, RJ45 connection. Provide EIA-485 card that can communicate BACnet MS/TP. The Communication Port is field connected to the operating BAS system. Interconnect wiring between the E² EIA-485 or Ethernet data serial port to the BAS is needed to complete the communication link.

The controllers must be configured with a CPU address to allow seamless communications to the BAS interface. Available data points are listed in the user's manual for assigning the data points mapping.

Cooling Control Sequences

The controller includes two control methods for maintaining desired air conditions. Return air temperature, humidity and dewpoint control are included with each controller package as a standard control method. All control and alarm conditions are based on the return air mounted sensor. Supply air temperature and humidity sensing shall be provided to allow the controller to control operating modes and alarms from a supply air sensor.

Return Air Sensor

The controller is provided with a temperature and humidity sensor factory unit mounted in the return air stream of the Precision AC unit. The sensor is front accessible located directly beneath the return air filters.

Psychrometric Control

The controller includes a user configurable temperature and humidity (relative humidity) or dewpoint control for dehumidification and humidification functions. When enabled for traditional relative humidity control, the controller continuously monitors the selected control sensors humidity (outdoor air or return air) to determine the activation of the humidifier or dehumidification functions. When enabled for dewpoint control, the controller continuously monitors the selected control sensors to compute the actual dewpoint conditions. The calculated dewpoint property is used to enable the humidifier or dehumidification functions which results in higher operational efficiency and shorter component usage.

Selected Options

Humidity Control

Dehumidification Cycle

The ceiling air conditioner shall be provided with a refrigeration-based dehumidification mode. Moisture is condensed on the cooling coil and discharged through the condensate drain. Reheat (electric, hot gas, steam or hot water) shall be provided to offset sensible cooling during the dehumidification cycle.

Hot Gas Reheat (DX Only)

A factory piped and wired hot gas reheat valve shall be provided to divert the hot compressor discharge gas from the condenser to the hot gas reheat coil during the dehumidification cycle to offset sensible cooling. This energy saving feature shall require no additional energy and shall be able to offset all of the sensible cooling capacity of the system.

Optional Filtration

High Efficiency Filters

The system shall be provided with a high efficiency return air filter box to include 2", 30% efficient prefilter(s) and 4", 95% efficient final filter(s). Filter efficiency shall be rated in accordance with ASHRAE 52-76 dust spot test standard. The filter box shall ship loose for field installation. The evaporator blower and motor shall incorporate CEILAiR's High Static Belt-Drive Blower option to compensate for the additional filter static pressure.

Head Pressure Control

Air Cooled - Low Ambient

0°F, Fan Cycling / Fan Speed

The air cooled system shall incorporate a low ambient fan cycling / fan speed head pressure control for year-round air conditioning system operation down to 0°F DB minimum ambient air temperature.

DX – Capacity Modulation / Freeze-Protection

SNAP ACTING, Hot Gas Bypass

The "OHS" ceiling A/C shall incorporate a hot gas bypass system to provide modulation of the unit's cooling capacity. This option shall also provide evaporator coil freeze protection under low load conditions.

Accessories

Low Profile Condensate Pump

A Low Profile condensate pump shall be provided for automatic removal of condensate and humidifier flush water (if applicable). In addition to the standard condensate pan overflow safety float(s), the condensate pump shall include an internal overflow safety float switch. When wired to the A/C's remote stop/start terminals, the switch shall open the A/C's control circuit, thereby shutting the A/C down in the event of a condensate overflow. The condensate pump shall be specifically designed to operate with the higher condensate temperatures caused by the flush and drain cycle of the electrode canister humidifiers.

Smoke Detector

An ionization smoke detector shall be factory installed in the evaporator section on the suction side of the evaporator blower.

Auxiliary Contact

The smoke detector shall be rated for high air velocity applications, and shall shut down the air conditioner upon sensing smoke in the return air stream.

Firestat

The air conditioner shall be provided with a factory wired and mounted firestat. The firestat shall shut down the air conditioner upon sensing a high return air temperature.

Remote Water Detector

A remote Single Point Water / Leak Detector shall be included to provide additional safety to the standard condensate pan safety float switch. Upon sensing a water leak, the normally closed water detector control circuit opens, thereby opening the unit's control circuit and shutting down the system. The remote water detector shall ship loose for field installation.

Additional Auxiliary Contact

An auxiliary dry-contact (n/o) terminal connection shall be provided for remote notification of a water detection alarm.

Main Power-Electric Non-Fused Service Switch

The main power service switch shall be the NEMA-3R or NEMA-1, non-fused type, depending on the OHS model selected. The disconnect switch shall have a lockable handle. Units designed for indoor use shall be provided with a NEMA-1 type switch. Units designed for outdoor use shall be provided with a rain-tight NEMA-3R type switch.

Power Service Switches

Field installed main power service switches shall be the standard option, however, switches can be optionally factory-mounted on select systems.

2.13 Dust Collection System

Provide centrifugal dust collector as manufactured by Oneida Air Systems, or equal with the following specifications:

- 10 HP, 460V , 3 phase TEFC Class F motor
- Magnetic motor starter with on-off switch
- Welded carbon steel impeller
- Outlet plenum, cyclone cone and barrel
- 99.9% @ 0.2-2.0 micron after filter (465 sqft surface area)
- Cold rolled steel primary build material
- (2) 55 gallon drums with wye connector
- Drop in silencers in after filters
- Pre-manufactured angle iron unit stand
- Drum grounding wire
- Assorted fasteners, fittings, gaskets, hoses and hose clamps
- 2 year warranty

2.14 Temperature Controls

- A. Furnish a totally native BACnet-based system, the system shall be an extension of the existing Automated Logic control system maintained by CIS. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135–2001, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section.
- B. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications.
- C. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
- D. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
- E. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
- F. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.
- G. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.
- H. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
- I. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

- J. Provide a comprehensive operator and technician training program as described herein.
- K. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.
- L. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system unless otherwise noted.
- M. Provide engineered control diagrams, sequence of operations and equipment cutsheets for submittal approval.
- N. Update existing head end system graphics for all new equipment in the building.
- O. Provide 1-year parts and labor warranty.
- P. Sequence of Operation:
 - 1. VRF Heat Pump Systems, Ductless Split Systems & Computer Room Units

These systems shall operate around their factory controls. The systems shall have a BACnet interface and shall output each indoor and outdoor unit to the BAS system. The BAS system shall have remote monitoring and control of all available points.
 - 2. Outside Air Units & Rooftop Units

The outside air systems and rooftop units shall operate around their factory controls. The systems shall have a BACnet interface and shall output each indoor and outdoor unit to the BAS system. The BAS system shall have remote monitoring and control of all available points.
 - 3. Miscellaneous Points:
 - Provide input to temperature control system from fire alarm system.
 - Provide firestat in all fans over 600 CFM.
 - Wire safety shutdown for all units over 2000 CFM connected to fire alarm duct detectors.
 - 4. Provide stand alone thermostats for exhaust fans and heaters.
 - 5. Provide control wiring for all heat pump, split system and rooftop systems. Coordinate with manufacturer for exact requirements.
 - 6. Provide master schedule for all units occupied/unoccupied mode.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment and controls shall be installed in accordance with manufacturer's recommendations. Installation, adjustments and starting shall be done under supervision of manufacturer's representative.
- B. All ductwork and equipment shall be installed in a neat and workmanlike manner in accordance with the guidelines of NFPA 90-A, SMACNA and the best practice of the trade.
- C. Provide manual firestats, set at 125 degrees F, in return inlets of all fans and blowers and all exhaust fans of 600 cfm and over.
- D. Upon completion of the installation of all work and equipment the Contractor shall start all equipment and make all necessary tests and adjustments to place entire heating, ventilating and air conditioning systems in a satisfactory condition for continuous safe operation of facilities.

END OF SECTION

TESTING AND BALANCING OF AIR SYSTEMS

SECTION 15850

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish all labor, equipment and services necessary for and incidental to Air and Water Systems Testing and Balancing.
- B. The Contractor shall procure the services of an independent testing and balancing agency. The Testing and Balancing Agency (TBA) specializes in testing and balancing of heating, ventilating, air-moving equipment, air-conditioning system and Hydronic systems. The Mechanical Contractor shall award the test and balance contract to the above agency as soon as possible after receipt of contract.
- C. Testing and Balancing shall not begin until the systems have been completed and are in full working order.
- D. Shop drawings must be provided to the TBA firm no later than 30 days after the final, approved shop drawings have been returned by the Architect to the Contractor.
- E. Duct leakage testing shall be the responsibility of the TBA subcontractor.
- F. Fire and smoke damper testing shall be done by the contractor and witnessed by the TBA firm.
- G. The final and complete Test and Balance Report shall be submitted, for approval, not less than two weeks before a final inspection of the Project is requested by the General Contractor. Failure to provide the Report shall be cause to delay the final inspection until the Report is Approved.
- H. Contractor is cautioned that test and Balance Report shall include both Grille counts, and Supply, Return, Outside Air and Exhaust Duct Traverses so that duct leakage can be calculated.

1.2 REFERENCES

- A. AABC – National Standards for Total System Balance.
- B. NEBB – Procedural Standards for Testing, Adjusting, and Balancing.

1.3 SUBMITTALS

- A. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

- B. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- C. Provide reports in soft cover, letter size, binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating, thermostat locations.

1.4 QUALITY ASSURANCE

Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Standards – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems or Testing Adjusting and Balancing Bureau (TABB)-National Standards for Environmental Systems Balance.

1.5 QUALIFICATIONS

TBA shall be a Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience.

PART 2 - PRODUCTS

2.1 ADJUSTMENT DEVICES

Replacement of adjustable pulleys, additional balancing dampers, additional fan belts, pressure taps and fitting, hydronic balancing valves and any other devices or equipment required to effect proper testing, adjusting and balancing shall be provided shall be provided by the Contractor at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.

6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
- B. Beginning of work means acceptance of existing HVAC conditions.

3.2 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets; Adjust total to within plus 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.3 ADJUSTING – GENERAL

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark setting of valves, dampers, and other adjustment devices allowing setting to be restored. Set and lock memory stops.
- C. After adjustment, take measurement to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At the time of final inspection the TAB agency may be required to recheck, in the presence of the Owner's Representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the Architect. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, shall not exceed 10% of the total number tabulated in the report.

3.4 AIR SYSTEMS PROCEDURE (MINIMUM REQUIREMENTS)

- A. Test and adjust fan RPM to design requirements.
- B. Test and record motor full load nameplate rating and actual ampere draw.
- C. Test and record system static pressures, fan suction and discharge.

- D. Adjust all main supply and return air duct to proper design CFM.
- E. Test and adjust each diffuser, grille and register (new and existing as indicated on drawings). Reading and tests of diffusers, grilles and registers shall include design velocity (FPM) and as adjusted velocity, design CFM and adjusted CFM.
- F. Test and record outside, mixed air and discharge temperatures (D.B. for heating cycle, D.B. and W.B. for cooling cycle).
- G. In coordination with the ATC contractor, set adjustments of automatically operated dampers to operate as specified, indicated and/or noted.
- H. Test and adjust air handling and distribution systems to provide required or design supply, return, outside and exhaust air quantities.
- I. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- J. Measure air quantities at air inlets and outlets.
- K. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- L. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- M. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- N. Provide system schematic with required and actual air quantities recorded at each outlet or inlet
- O. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- P. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.
- Q. Measure temperature conditions across air, return air, and exhaust dampers to check leakage.
- R. Where modulating dampers are provided, take measurement and balance at extreme conditions.
- S. Measure and record pressure differentials between designated spaces.

3.6 REQUIRED REPORTS TO BE SUBMITTED

The following reports shall be submitted, as a minimum, with a complete Title Page, Summary, and Instrument List. All data and nomenclature shall be provided, as required by AABC and/or NEBB Procedure manuals, for each device tested and balanced.

1. Electric Motors.
2. V-Belt Motors.
3. VFD Drives.
4. Air Moving Equipment.
5. Return Air/ Outside Air Data.
6. Exhaust Air Data.
7. Duct Traverses.
8. Air Distribution Test Sheets.

3.7 COMMISSIONING

- A. Balancing Agency shall coordinate with the Mechanical Contractor the Commissioning requirements as here-in-before specified.
- B. Contractor is cautioned that the Owner, thru the Architect, reserves the right to check and verify any and all points and readings of the Test and Balance report. If 15% or more of the points do not agree with the report, then the Contractor shall re-test and re-balance the entire project and submit a complete new Report. If 15% or more of this new Data is independently verified and still does not agree with the Contractor's new Report, then the Owner has the right to hire an Independent Test and Balance Contractor and the Original Contractor shall be held responsible to pay these costs.
- C. All TAB deficiencies shall be corrected when found. Any deficiencies that are (for whatever reason) not corrected immediately shall be shown in the TBA report and listed on a summary sheet in the front of the TBA report. The TBA report must be completed and accepted by the Mechanical Engineer before the project is accepted and all items on the summary sheet shall become punch list items with dollar values assigned to them.

END OF SECTION

VALVES, STRAINERS, UNIONS AND FITTINGS

SECTION 15900

PART 1 – GENERAL

1.1 SUMMARY

The work under this heading includes the furnishing and installing of all required appurtenances incidental to the piping systems as indicated on the drawings. Refer to BASIC MATERIALS AND METHODS SECTION which shall apply to all work in this Section.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide factory-fabricated valves for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is installer's option. Valves shall be of same make for all these services.
- B. Valves shall comply with the following:
 - Gate - cast iron - MSS SP-70
 - Gate - bronze - MSS SP-80
 - Globe - cast iron -MSS SP-85
 - Globe - bronze - MSS SP-80
 - Ball - MSS SP-110
 - Butterfly - MSS SP-67
 - Check - cast iron - MSS SP-71
 - Check - bronze - MSS SP-80
- C. Gate valves shall be equipped with packing suitable for intended service. (Under no circumstances is asbestos acceptable.) Valves shall be designed so back seating protects packing and stem threads from media when valve is fully opened, and equipped with gland follower. Guides for disc on rising stem valves shall be machined for accurate fit.
- D. Globe valves shall be equipped with packing suitable for intended service. (Under no circumstances is asbestos acceptable.) Globe valves shall be designed so back seating protects packing and stem threads from media when valve is fully opened, and equipped with gland follower.
- E. Ball valves shall have FULL port opening blow out proof stem: hard chrome plated forged brass ball, rated not less than 600# W.O.G. for sizes 3" or smaller.
- F. Provide gear operators on butterfly valves 8" and larger. Valve bodies shall have extended necks to provide for 2-1/4" insulation.

- G. Provide valves with features indicated and where not otherwise indicated, provide proper valve features as outlined in this specification. Comply with ANSI B31.1.
- H. Valve flanges shall comply to ANSI B16.1 (cast iron), ANSI B16.5(steel), ANSI B16.24 (bronze). Steel flanges shall be Class 150.
- I. Threaded valve ends shall comply with ANSI B2.1.
- J. Butt-Weld valve ends shall comply with ANSI B16.25.
- K. Solder Joint valve ends shall comply with ANSI B16.18.
- L. Flangeless valve bodies shall be manufactured to fit between flanges and shall comply with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
- M. Fabricate pressure-containing components of valves, including stems and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing that resist de-zincification.
- N. Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
- O. Butterfly valves shall be designed for flow regulation, and manufactured to be tight in closed position. Test pressures in accordance with MSS SP-67 as follows: Seat 2-12" 220psi. No leakage shall be permitted under test.

2.2 GATE VALVE FOR COPPER PIPING (SERVICES UNDER 200 DEGREES F)

- A. Flanged Ends 2-1/2" and Larger: Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge. Provide dielectric gasket and bolt isolators.
- B. Solder Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, solid wedge. (Non-rising stem gate valves may be used where headroom prevents full extension of rising stems.)

2.3 BALL VALVES (SERVICES UNDER 200 DEGREES F)

- A. Threaded Ends 3" and Smaller: 600# W.O.G., forged brass two piece body, hard chrome plated forged brass ball, blow-out proof stem.
- B. Soldered Ends 2" and Smaller: 600# W.O.G., forged brass two piece body, hard chrome plated forged brass ball, true adjustable packing nut ("O"-ring only type stem seal not acceptable), blow-out proof stem.
- C. Flanged Ends 2-1/2" and larger: Class 150, flanged ends, carbon steel body with 316 s.s. trim, uni-body design, full port, blowout proof s.s. stem and ball, teflon seat.

2.7 UNIONS IN COPPER LINES (SERVICES UNDER 200 DEGREES F)

Cast Bronze Unions.

2.8 UNIONS IN BLACK STEEL, WROUGHT IRON OR GALVANIZED STEEL PIPING

Ground joint malleable iron galvanized Class 300 for 2" nominal pipe sizes or below. For pipe sizes 2-1/2" and larger use forged steel welding flanges (Galvanized for galvanized piping).

2.9 UNIONS IN CONNECTION BETWEEN COPPER AND STEEL OR IRON PIPING (SERVICES UNDER 200 DEGREES F)

Provide bronze valves or dielectric waterways.

2.10 BALANCING VALVES

Valves 1/2" to 2" pipe size (NPT or Sweat) to be of dezincification brass or bronze construction. Valves 2-1/2" to 12" pipe size shall be cast iron for flanged models or ductile iron for grooved models. Valves shall be globe type rated 175 psi for iron and 240 psi for brass/bronze at 250 degrees F. Valves to have concealed memory stop feature and visual position readout. Each valve shall have two metering/test ports with internal check valves and protective caps. Valves to be leak-tight at full rated working pressure. All valves to be provided with molded insulation to permit access for balance and read-out. Nibco model T or S1710 (1/2" to 2"), F or G737 (2-1/2" to 12"), DeZurik series 12.30-1 or approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND INCIDENTAL ITEMS

- A. All valves shall be installed so as to be easily accessible for cleaning, inspection, maintenance, and operation.
- B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Provide chain operators on all valves over 6' above floor in mechanical rooms.
- C. Except as otherwise indicated, install valves with the following ends or types of pipe/tube connections:
 - Tube Size 2" and smaller - Soldered-joint valves
 - Pipe Size 2" and smaller - Threaded valves
 - Pipe Size 2-1/2" and larger - Flanged end valves
- D. Install swing check valves in horizontal position, unless otherwise shown on drawings, with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow.

- E. Provide access panels at all concealed valves.
- F. Major control and sectionalizing valves throughout building shall be identified by means of a brass valve tag bracketed to valve handle. Contractor shall prepare schedule of such identifying plates and frame under glass for installation in main equipment room.
- G. All welded piping to be welded by certified welders skilled in the work to be done.
- H. No piping of dissimilar metals placed in contact or in close proximity with each other. Provide bronze valves wherever piping of dissimilar metals is joined.
- I. Run all piping concealed unless specifically noted otherwise, making all necessary offsets, turns, etc., necessary to conceal piping from view.
- J. Provide all necessary steel frame supports, anchor bolts, sleeves, etc., required for safe support of equipment and piping installed under this contract. The Mechanical Contractor shall be completely responsible for the accurate position and dimensions of all foundations and support items.

END OF SECTION

SECTION 16010 – ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. General electrical requirements
 - 2. Temporary Construction Power
- B. These specifications are intended to provide for labor, materials, equipment, and services and of performing all operations required for the complete electrical system as specified herein and/or shown on the accompanying drawings.

1.3 SUBMITTALS

- A. Refer to Division 1 for Submittal Requirements. The following paragraphs are an extension of Division 1.
- B. Where names of manufacturers or catalog numbers are listed in the Specification and/or on the accompanying drawings it is to establish a standard for the type, general design and quality of the product required. Where “or approved equivalent” is indicated, other products similar in design and of equivalent quality and complying with the Drawings and Specifications will be considered for acceptance. See Division 1 Section “Product Substitutions”. “Similar in design” and “equivalent quality” will be determined by the architect, engineer and lighting consultants.
- C. Any item not specified herein, but submitted as a substitute for the specified item, shall be submitted in accordance with Division 1 Section “Product Substitutions” and accompanied by manufacturer’s documentation stating/illustrating the following applicable information in addition to the specific information requested in other sections:
 - 1. Dimensions/weight.
 - 2. Electrical ratings-voltage, amperage, short circuit capability, etc.
 - 3. Construction – gauge of steel/aluminum, paint finish/application method, color, NEMA type, etc.
 - 4. Warranty.
 - 5. Local manufacturer’s representative or nearest stocking distributor.
 - 6. Length of time the product has been available to the public.
 - 7. Specific deviations.

D. Shop Drawings: Listed below are shop drawings required for submittal

1. Panelboards
2. Circuit Breakers
3. Coordination Study
4. Wiring Devices and Floor Boxes
5. Raceways, Boxes and Fittings
6. Wiring/Cables
7. Disconnect Switches & Fuses
8. Generator
9. Transfer Switches
10. Light Fixtures
11. Fire Alarm System
12. Access Control System
13. Intrusion Detection System
14. Video Surveillance System
15. Telecommunications System

E. Comments made on Shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Shop Drawings will be checked for general conformance with the design concept of the project and general compliance with the documents. Review of the Shop Drawings shall not relieve the Contractor from responsibility for conforming and correlating all quantities and dimensions, coordinating work with that of all other trades, and performing work in a safe and satisfactory manner. Review of Shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from Contractor, stating that he has reviewed the submittal and checked it for compliance.

F. CLOSEOUT DRAWINGS:

1. Operation and Maintenance Manuals:
 - a. Before the date of substantial completion, Contractor shall furnish to the Architect three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings".
 - b. Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.
 - c. This submittal shall be accompanied by test results for all tests required in other sections of the specification, final Electrical Inspection Certificate from the authority having jurisdiction and Statement of Inspection from State Fire Marshal's Office.
2. Record Drawings:
 - a. Prepare Record Drawings in accordance with the requirements in Division 1.
 - b. In addition to the requirements specified in Division 1, indicate the following installed conditions:
 - 1) Equipment locations (exposed and concealed), dimensioned from prominent building lines.

- 2) Approved substitutions, Contract Modifications, and actual equipment and materials installed.
 - 3) Underground conduits both interior and exterior, drawn to scale and fully dimensioned.
 - 4) Grounding systems.
- c. Transmit record drawings to Architect.

1.4 QUALITY ASSURANCE

- A. The electrical installation shall conform to the requirements of the latest edition of the National Electrical Code (NEC). Notify Architect of conflicts before installation.
- B. Electrical material shall be built and tested in accordance with the applicable standards of the National Electrical Manufacturers' Association (NEMA), the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), and the Institute of Electrical and Electronic Engineers (IEEE).
- C. All applicable sections of the following codes and standards (latest edition) shall also be followed:
1. NFPA, including but not limited to, NFPA 70 (NEC) and NFPA 101 (Life Safety Code).
 2. ADA (Americans with Disabilities Act)
 3. International Building Code (latest edition)
 4. Applicable state and local codes/ordinances.
 5. CBM – Certified Ballast Manufacturer.
 6. IPCEA – Insulated Power Cable Engineers' Association.
 7. FM – Factory Mutual.
 8. ETL – Electrical Testing Laboratories.
 9. IES – Illuminating Engineering Society.
- D. Include all items of labor and materials required to comply with the above referenced codes and standards. Where quantities, sizes, or other requirements indicated on Drawings or herein specified are in excess of the requirements of the Standards and Codes, the Specifications or Drawings shall govern. Where a conflict exists the more restrictive shall be bid.

1.5 COORDINATION

- A. Power Characteristics: For all items requiring power provided in sections of Division 2 through 15, the Contractor is to verify all electrical requirements, including voltages, ratings and any other electrical characteristics with actual equipment to be furnished and adjust work as required to provide proper electrical service to the particular item at no extra cost to owner. Notify the Architect before starting work if changes from the work shown on the drawings will be necessary.
- B. Coordination of Options and Substitutions: Where contract documents permit selection from several product options, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.
1. Panelboard and circuit breaker ratings and feeder sizes for mechanical equipment are based on a particular "basis of design" manufacturer. These equipment loads are

provided within the schedules on the mechanical plans. Any equipment substitutions, including substitutions from approved manufacturers, may result in circuit breaker and feeder size changes. This contractor shall coordinate with the mechanical contractor at time of bid and account for all required electrical changes and necessary engineering costs in his bid. There will be no additional cost approved for electrical changes as a result of mechanical equipment substitutions.

- C. Raceways, Wiring, Safety/Disconnect Switches, etc. for Equipment by Others: Electrical service required for all equipment furnished under Division 15 (Mechanical), 16 (Electrical), or other Divisions of this Specification shall be furnished and connected as part of this work. It is part of the work of this Division to obtain correct roughing-in dimensions and requirements for this equipment and provide labor, materials, equipment and services for a complete installation.
- D. For exposed electrical work, coordinate colors and finishes with the Architect. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.
- E. Coordinate installation of required supporting devices and set sleeves in cast-in place concrete, masonry walls, and other structural components as they are constructed.
- F. Coordinate location of access panels and doors for electrical items that are behind finishes surfaces or otherwise concealed.
- G. MECHANICAL WORK:
 - 1. Coordinate electrical work with mechanical work (Division 15) for proper service to each item of equipment requiring electrical connection prior to rough-in. Determine, with each mechanical equipment installer, the proper sequencing and location for disconnect switches and similar points of interface between mechanical and electrical work.
 - 2. Except as otherwise indicated, final power connections are provided under Division 16 – Electrical.
 - 3. Except as otherwise indicated, control wiring, 50 volts and less, and associated raceway system shall be provided under Division 15 - Mechanical.
 - 4. Control wiring, 120 volts and above, and associated raceway systems shall be provided under Division 16 – Electrical.
 - 5. Except as otherwise indicated, magnetic starters (including variable speed drives) shall be furnished under Division 15 – Mechanical, and mounted and connected under this division.
 - 6. Overload elements in starters shall be selected according to actual motor nameplate full load current. Responsibility for this coordination shall lie with the Division under which the particular starter is furnished.
 - 7. Except as otherwise indicated, power disconnect switches and single speed manual starting switches shall be furnished and installed under this Division. Where combination magnetic starters are provided as work of another Division, the associated disconnect switch will be furnished as work of that Division. Fuses shall be furnished and installed under this Division. Except as otherwise indicated, disconnect switches for control wiring shall be furnished and installed under Division 15- Mechanical.
 - 8. Firestats for fans shall be furnished, installed and connected under Division 15 – Mechanical. Duct detectors shall be provided and connect to the building fire alarm system under this Division.

H. EQUIPMENT LAYOUT:

1. The physical location and arrangements of electrical equipment is shown on the plans and is to be used by the Contractor. Alternate arrangements due to field conditions or changes in physical size of the equipment proposed for the project are to be submitted to the Architect for review before any work is begun or equipment ordered. The alternate arrangement is to be presented in a 1/4 inch scaled drawing showing all equipment, including those of other contractors. Include shop drawing cut sheets and applicable information. Indicate on the drawing by dimension all required Code clearances, wiring distances and maintenance access requirements. Where equipment heights are required to be coordinated with architectural or other items, indicate revised heights.
2. Where the design intent of the installation is not certain, ask for clarification. Lack of details will not be an excuse for improper installation. Any such work must be corrected at no expense to the Owner.
3. Coordination Drawings: For locations where several elements of the work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4") required for the installation. Raceways shall be coordinated with other trades and building elements to avoid conflicts. Prepare coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
4. Contractor shall be responsible to ensure that equipment selected fits in spaces allocated, with provisions for maintenance and/or code required access and clearances.

I. DELIVERY, STORAGE AND HANDLING

1. The Contractor shall be responsible for receiving, unloading, storing, protecting from weather, theft, breakage, etc., all electrical equipment, and material either purchases by the Contractor or furnished by others. The Contractor shall remove such material from storage and transport it to the site of erection when required for construction. The Contractor shall protect his own tools in a like manner. Also, the Contractor shall protect all equipment from accidental damage due to operating and maintenance activities that will be in progress in the same area.
2. Storage Coordination: It is recognized that space at project for storage of materials and products is limited. Coordinate deliveries of electrical materials and products with scheduling and sequencing of work so that storage requirements at project are minimized. In general, do not deliver individual items of electrical equipment to project substantially ahead of time of installation.
3. At all times take precautions necessary to properly protect electrical equipment from damage. Failure to comply with the above to the Architect's satisfaction shall be sufficient cause for the rejection of the particular piece of apparatus in question.

1.6 PHASED CONSTRUCTION; SEQUENCING

- A. Refer to Division-1 provisions for determination of how construction phasing and sequencing requirements may affect performance of electrical work.

1.7 ALTERNATES

- A. There may be certain alternates involved in the construction. The Contractor is cautioned to be aware of and to provide appropriate adjustments for all alternates described in the specifications or on the drawings.

1.8 PERMITS, INSPECTIONS AND FEES

- A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and regulations including those of the National Fire Protection Association and all municipal, state or other authority having jurisdiction over the work. Include all fees for services in bid.
- B. Certificates of Inspection: Upon completion and before the date of substantial completion of each designated Phase, furnish a certificate of inspection issued by the proper authorities to the effect that the installation is in full conformity with all local and state requirements.

1.9 WARRANTY

- A. The Contractor shall guarantee the work installed by him for one year from the date of final acceptance of the project and shall furnish free of cost to the Owner materials and labor necessary to repair or replace defective items of workmanship. The Contractor shall guarantee all equipment to be of the quality and capacity specified.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. The provisions outlined below expand or modify the requirements as applicable to electrical work. Refer to other DIVISION 16 sections for additional requirements.
- B. Materials and equipment shall conform in all respects to the requirements set forth in these Specifications and the accompanying Drawings.
- C. Provide products which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with the Architect. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement. For concealed electrical work requiring access, provide access panel, complete with anchorages and hardware, of adequate size for intended access.
- D. All electrical products on this project shall conform, unless otherwise specifically noted, to applicable standards of the National Electrical Manufacturer's Association and shall be listed by the Underwriter's Laboratories, Inc.

- E. Where materials, equipment, apparatus, or other products are specified by manufacturer, brand name or type, or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the bid. Except where noted, it is implied that “or approved equal” follows all specified items.
- F. Any bills of materials, conduit and wire schedules, etc., shall be used for identification, type, and reference. It shall be the responsibility of the Contractor to determine exact quantities and components required to effect a complete job in accordance with drawings and associated specifications.
- G. Equipment shall be installed in strict accordance with manufacturer’s instructions. Contractor shall obtain these instructions and they shall be considered a part of these specifications.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with all federal, state and local safety laws, ordinances and regulations relating to the building and public health and safety.
- B. No work shall be concealed until approved by the local inspector and all local regulations are adhered to.
- C. Electrical Drawings are diagrammatic except where dimensioned. Do not scale. Follow manufacturer’s certified Shop Drawings for accuracy. Consult Architect in cases of doubt or conflict. Unless noted as fixed, dimensions are based on the product of one (1) manufacturer. Verify dimensions with certified Shop Drawings of the materials actually approved and purchased.

3.2 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE: Furnish and install provisions for temporary electrical service and construction light and power during the construction period conforming to all local code and State labor law requirements.

- A. Arrange for temporary service with the Utility Company.
- B. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed and “alive”, switch-over of temporary light system, for the building while under construction.
- C. Furnish, install, and maintain temporary feeders to permanent mechanical equipment and existing distribution and power electrical panels requiring service before permanent feeders are ready for same.
- D. Provide and and/or all relocations of temporary electric facilities as necessary to clear the permanent installations of all trades.
- E. Provide temporary panels, wires, conduits, etc. as required, to keep in operation the different building areas during construction. No additional compensation shall be provided to the

Contractor to provide electrical power to all existing lights, receptacles, devices, HVAC equipment, etc., to keep these said areas in operation during construction.

- F. Provide all required lighting for stairways to meet the requirements of all authorities having jurisdiction.
- G. Refer to the Project Schedule for sequencing of the work. All electrical related services to and within the limits of work phasing areas not currently under construction, shall be maintained in complete functional operation. All electrical related work in areas designated by the work phasing plan to be under construction shall be made complete and functionally operable prior to proceeding with any other phase of the work.
- H. Remove all temporary electrical service equipment from the building when temporary services are no longer required.

3.3 INSPECTION AND PREPARATION

- A. Substrate Examination: Installer of each element of electrical work shall examine condition of substrate to receive work, and conditions under which work will be performed, and shall make notification of conditions detrimental to completion of work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Existing Facilities and Conditions: The Contractor shall visit the building sites to determine existing conditions and will be held responsible for allowing for these conditions in his bid. This area of work may have existing storm drainage, mechanical and electrical utilities, etc. located underground. It is part of this work for the Contractor to determine the scope and location of all existing utilities and the scope and location of all new utilities to be installed concurrent with this project and arrange his work around others. Damages to existing utilities by the contractor shall be corrected by him at no additional compensation. Contractor shall call 1-800-272-3020 per Louisiana statutes.
- C. Large and Heavy Equipment: Where possible, prearrange for movement and positioning of large equipment into the building structure, so that enclosing walls and roofs will neither be delayed nor need to be removed. Otherwise, make notice of opening requirements to be maintained for subsequent entry of large equipment units.

3.4 CUTTING AND PATCHING

- A. Structural Limitations: Do not cut structural framing, walls, floors, decks and other members which are load bearing, except with the written consent of the Architect. Authorization will be granted only where there is no other reasonable method for completing electrical work, and where proposed cutting clearly does not materially weaken the structure.
- B. Other Work: Do not endanger or damage other work through procedures and processes of cutting to accommodate electrical work. Review proposed cutting with Installers of the work to be cut, and comply with their recommendations to minimize damage. Where necessary, engage original Installer or other specialists to execute cutting in recommended manner.

- C. Patching: Where patching is required to restore other work, because of cutting or other damage occurring during installation of electrical work, execute patching in manner recommended by original Installer. Original Installer, where patching of finishes existing prior to beginning of work, refers to those performing similar work in areas of new construction. Restore other work in every respect, including elimination of visual defects in exposed finishes, as judged by Architect.
- D. Provide, properly located and sized, all required chases, shafts, openings, furred spaces, etc., required for the work or to conceal any of the work, in any part of the structure.
- E. It is the responsibility of this Division to coordinate with other responsible Divisions for required cutting and patching.

3.5 ELECTRICAL INSTALLATION

- A. Conform with arrangement indicated by contract documents, recognizing that portions of work are shown only in diagrammatic form.
- B. These specifications and accompanying drawings are intended to describe complete workable systems of the various types. Items of materials, work, or equipment not mentioned, but normally necessary for the proper execution of this work, shall be provided as if specifically called for.
- C. The drawings show approximate locations only of feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves the right to make changes in locations indicated, before roughing-in, without additional cost to the Owner.
- D. Because of the small scale of the drawings, it is not possible to indicate all of the offsets, fittings, pull/junction boxes and accessories required. Investigate the structural and finish conditions and arrange work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
- E. Where coordination requirements conflict with individual system requirements, comply with the Architect's decision on resolution of conflict.
- F. Sequence, coordinate, and integrate various elements of electrical work so that electrical system will perform as indicated and be in harmony with other work of building. Architect will not supervise coordination, which is exclusive responsibility of Contractor.
- G. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on wiring devices and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work. Locate operating and control equipment and devices for easy access. Maintain NEC code working clearances around all electrical equipment.
- H. Install access panels where electrical work requiring access is concealed by finishes and similar work. Access panels utilized shall be approved by the Architect.

- I. Integrate electrical work in ceiling plenums, including lighting fixtures, with ceiling finish, suspension, ductwork, air diffusers and other work, so that required performances of each will be achieved.
- J. Where work is in close proximity to the work of other contractors, the Electrical Contractor shall review plans of other contractors and coordinate his work with theirs. The Electrical Contractor shall verify the location of lighting fixtures, beams, structural members, conduit, ductwork, pipes or other obstructions before beginning his work in the area. Notify the Architect where proper clearances do not occur or where the work of others would interfere with the safe and/or proper operation of this work. Give right-of-way in confined-service spaces to piping which must slope for drainage, and to larger HVAC ductwork and similar services which are less conformable than electrical services.
- K. Fireproofing: Where conduit and/or cables penetrate fire-resistant/rated walls, partitions, ceilings, or floors, adequate fire seals using UL listed methods and products listed for the application to maintain the fire-resistance rating shall be provided and installed.

3.6 MOUNTING HEIGHTS

- A. Unless otherwise noted on the drawings or required by the Architect, the following mounting heights shall apply. Heights are to center of device unless noted otherwise:

Toggle Switches	4'-0"
Receptacles	1'-6"
Motor Control Equipment	5'-0"
Panelboards	6'-6" to top (not more than 5'-6" from top most operating handling to floor.)

- B. Upon approval of the Architect, mounting heights may be adjusted to simplify cutting of concrete blocks in block walls or to facilitate furniture, base or cabinet arrangements. All mounting heights may be field adjusted by the Architect without any additional cost.

3.7 SERVICE CONTINUITY

- A. At all times during the construction of the project, services (power, telephone, fire alarm, etc.) shall be maintained to all portions of the site except with prior written approval of interruptions. Any required interruptions of services (power, telephone, fire alarm, etc.) due to work being performed under this contract shall be scheduled in advance after consultation with the Architect and the Owner.
- B. At least 14 days prior to the requirement of any interruption of services, the Contractor shall furnish to the Architect for approval a written plan for the work associated with the outage including a description of the installation and removal of temporary wiring and facilities necessary to be installed.

3.8 ACCESS TO ELECTRICAL WORK

- A. Install access units in accordance with manufacturer's written instructions, in compliance with NEC, and with recognized industry practices.
- B. Coordinate with other work, including substrate construction work, as necessary to interface installation of access units with other work.
- C. Locate each removable access unit accurately in relation to electrical work requiring access.
- D. Provide adequate temporary support or attachment to framing or formwork so that units will not be dislocated during construction of substrates.
- E. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.
- F. Adjust hardware and panels after installation for proper operation.
- G. Remove and replace panels or frames which are warped, bowed, or damaged.

3.9 WORKMANSHIP

- A. All workmanship shall be of the highest quality. Any work judged substandard by the Architect shall be redone at the Contractors expense. Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents. Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel to building lines. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

3.10 FIELD QUALITY CONTROL

- A. As a minimum, upon completion of installation of electrical connections, and after circuitry has been energized, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement.

3.11 CLEANING UP

- A. Remove once per week and at the completion of the work all empty cartons, scrap wire, raceways, rubbish, etc., accumulated on the project as a result of work performed.
- B. Remove all marks, stains, fingerprints, bugs, dust and other foreign material from all electrical components. Refinish damaged surfaces and restore original finish to the satisfaction of the Architect.
- C. After final performance test run of each electrical system, clean system both externally and internally. Touch-up minor damage to factory-painted finishes; refinish work where damage is extensive.

- D. Construction Equipment: After completion of performance testing and Owner's operating instructions and demonstrations, remove installer's tools, test facilities, construction equipment and similar devices and materials used in execution of work but not incorporated in work.

- 3.12 SAFETY: It shall be the Contractor's responsibility to do all things necessary in the pursuit of the installation or testing to provide safe conditions in which to work.

END OF SECTION 16010

SECTION 16020 – ELECTRICAL DEMOLITION

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

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 PROJECT CONDITIONS

- A. Storage or sale of removed items or materials on-site is not permitted.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Field measurements and circuiting shown on drawings is based on casual field observation and existing record documents, and may not reflect actual conditions. Verify field measurements and existing circuiting prior to work, and report discrepancies to Architect/Engineer before disturbing existing installation.
- B. Verify that wiring and equipment to be disconnected serve only abandoned facilities not required to remain.

3.2 PREPARATION

- A. Disconnect electrical systems noted for removal.
- B. Coordinate service outages for power, telephone, fire alarm, etc with Owner.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove all abandoned wiring to source of supply.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut abandoned conduit flush with existing walls and floors to remain, and patch surfaces.
- C. Where electrical items (i.e. conduits, boxes, wiring, etc) are required to remain in areas of new construction, and interfere with the new construction, relocate those items as required to avoid the new construction.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlet box if conduit servicing the box is abandoned and removed. Provide blank cover for abandoned outlet boxes which are not removed.
- E. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers, and other accessories.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.

- G. For item noted to be removed on the drawings, remove associated existing wiring and conduits not required to be re-used. Re-feed any items fed through removed items as required with new circuiting to match existing. Field verify and adjust demolition as required to accommodate actual existing circuiting arrangement.
- H. Coordinate exact scope of demolition with Architect and disconnect and remove additional items if required, whether specifically shown on drawings or not.
- I. Do not re-use any conductors removed from existing conduits runs.
- J. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Protect items from damage during transport and storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- K. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 SALVAGED MATERIAL

- A. Removed and Salvaged Items: The Owner shall have priority for the selection of salvaged material and equipment. Any equipment and material selected to remain the property of the Owner shall be removed and delivered to a location on the site as designated by the Owner. Material and equipment not retained by the Owner shall become the property of the Contractor and shall be removed from the site by him.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Division 1.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 16020

SECTION 16060 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

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 UL 467 for grounding and bonding materials and equipment.

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. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

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.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad (13 mil); 3/4 inch by 10 feet (19 mm by 3 m) in diameter.
- B. Concrete Encased Grounding Electrode: Electrically conductive rebar (not less than 1/2" diameter) or #4 AWG bare copper conductor of at least 20 foot length.
- C. Metal Frame of Building: Metal frame that is connected to earth by hold down bolts.

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. Grounding Bus: Install in telephone equipment rooms, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 96 inches above finished floor unless otherwise indicated.
- C. 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 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- C. 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 minimum No. 4 AWG (or size as otherwise indicated) 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.
- D. 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.

3.4 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. One of the ground rods shall be a test well.
- C. Concrete Encased Grounding Electrode: Metallic components shall be encased in not less than 2" of concrete and shall be located horizontally within that portion of concrete foundation that is in direct contact with earth. If multiple concrete encased electrodes are present at the site, it shall be permissible to bond only one to the grounding electrode system.
- D. Metal Frame of Building: Connect the metal frame hold down bolts for structural steel columns to earth by connecting the hold down bolts to a concrete-encased electrode located in the support footing or foundation. The hold down bolts shall be connected to the concrete encased electrode by welding, steel tie wires or other approved means.
- E. 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.
- F. 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 by 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.

- G. Test Wells: Ground rod driven through drilled hole in bottom of handhole. and shall be at least 12 inches (300 mm) deep, with cover.
 - 1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- H. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- I. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart. Bond ground rod to structural steel.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 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, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
 - 5. Substations, Pad-Mounted Equipment, and main facility grounding field electrode system: 5 ohms.
 - 6. Manhole Grounds: 5 ohms.

- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. 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.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and 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.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.

- 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
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.

2.3 MATERIALS: SUPPORTS AND ALL COMPONENTS

- A. Indoor (Dry): Galvanized steel.
- B. Indoor (Wet): Stainless steel.
- C. Outdoor, above grade: Stainless steel.
- D. Outdoor, below grade: Non-metallic with stainless steel hardware.

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 in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 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 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, 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.
- 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 thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches 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.
- 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. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.
- C. Install hangers, anchors, sleeves and seals, in accordance with manufacture's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installations of supporting devices.
- D. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- E. Install hangers, supports, clamps and attachments to support conduit properly from building structure. Arrange for grouping of parallel runs of horizontal to be supported together on trapeze type hangers where possible.
- F. Groups of three or more conduits shall be supported by metallic slotted support system and threaded hanger rods. Wire hangers and conduit as supports will not be acceptable.
- G. Support all equipment covered by this specification directly from building structural members independent of any ceiling or any other installed item. Panelboards and switches may be attached to suitably reinforced walls. Ground or slab mounted equipment shall be mounted on a separate four inch high concrete housekeeping steel reinforced slab.
- H. Do not attach items of this specification to HVAC ductwork, ceiling grids and ceiling support members, piping or other equipment unless specifically shown otherwise. Position all supports and equipment such that access through lay-in ceilings or panels is not impaired and all Code required clearances are maintained.
- I. Where applicable, under no circumstances is the Electrical Contractor to attach to support from any bar joist bridging. Any supports to the bar joists or any structural systems are to be approved by the Architect.
- J. Wire shall not be used with or without spring steel fasteners, clips, or clamps for the support of any conduit. Wood products shall not be used for the support or attachment of conduit or electrical equipment unless specifically noted otherwise.

3.4 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.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 16073

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification for conductors.
 - 3. Instruction signs.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- 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.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Equipment connected to normal power to be white letters on a black background. Minimum letter height shall be 3/8 inch.

2.2 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 9 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. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- B. 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 maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- C. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- D. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. 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. Panel Name.
 - 2. Circuit Number.
- B. 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 service, 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.
 - 4) Neutral: White.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral: Gray.

- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches 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.
 - e. Green colored tape shall only be used for equipment grounding conductors.
 - f. The HI-leg on a 120/240v-3ph system shall have orange color per NEC.
- C. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- E. 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.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Apply to exterior of door, cover, or other access.
 - 3. For equipment with multiple power or control sources, apply to door or cover of equipment.
- G. 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.
- H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding.
- I. 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: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide two lines of text with 1/2-inch- high letters on 2-inch-

high label. First line shall be equipment designation/name. Second line shall be equipment voltage and where equipment is fed from.

- b. 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.

2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label. Mark available fault current at each panel per NEC.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. In existing panels, switchboards and motor control centers where the loads have changed as a result of this project, provide a new typed circuit directory (panelboard) or engraved, laminated acrylic or melamine label (switchboard or motor control center) to identify the new load.

END OF SECTION 16075

SECTION 16100 - OVERCURRENT PROTECTIVE DEVICE COORDINATION

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 computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study.
 - 1. Include all overcurrent protection for project, including all panels, enclosed switches and circuit breakers, generator main breakers and breakers for elevator and fire pump.
 - 2. The contractor shall be responsible for gathering all input data, including but not limited to, utility transformer data, generator data, low voltage transformer data, load information, and feeder lengths. Data for new and existing equipment and feeders shall be provided for a complete study.
 - 3. The contractor shall adjust circuit breaker settings on all adjustable circuit breaker trip units.

1.3 SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.
- C. Qualification Data: For coordination-study specialist.
- D. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals must be in digital and written form.
 - 1. Coordination-study input data, including completed computer program input data sheets.
 - 2. Study and Equipment Evaluation Reports.
 - 3. Coordination-Study Report.

1.4 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.
- B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CGI CYME.
 - 2. EDSA Micro Corporation.
 - 3. ESA Inc.
 - 4. Operation Technology, Inc.
 - 5. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
 - 1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Mutual coupling in zero sequence.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.
 - 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

- A. Gather and tabulate the following input data to support coordination study:
 - 1. Product Data for overcurrent protective devices and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Impedance of utility service entrance.
 - 3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
 - a. Circuit-breaker and fuse-current ratings and types.
 - b. Relays and associated power and current transformer ratings and ratios.
 - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
 - d. Generator kilovolt amperes, size, voltage, and source impedance.
 - e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
 - f. Busway ampacity and impedance.
 - g. Motor horsepower and code letter designation according to NEMA MG 1.
 - 4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Generator thermal-damage curve.
 - e. Ratings, types, and settings of utility company's overcurrent protective devices.
 - f. Special overcurrent protective device settings or types stipulated by utility company.
 - g. Time-current-characteristic curves of devices indicated to be coordinated.

- h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
 - 1. Switchboard bus.
 - 2. Distribution panelboard.
 - 3. Branch circuit panelboard.
 - 4. Fire Pump Controller
- B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.
 - 1. Transformers:
 - a. ANSI C57.12.10.
 - b. ANSI C57.12.22.
 - c. ANSI C57.12.40.
 - d. IEEE C57.12.00.
 - e. IEEE C57.96.
 - 2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
 - 3. Low-Voltage Fuses: IEEE C37.46.
- E. Study Report:
 - 1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
 - 2. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.
- F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

- A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
 1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
 2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
 3. Calculate the maximum and minimum ground-fault currents.
- B. Comply with IEEE 241 and IEEE 242 recommendations for fault currents and time intervals.
- C. Transformer Primary Overcurrent Protective Devices:
 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.
- E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
 - a. Device tag.

- b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
 - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
 - d. Fuse-current rating and type.
 - e. Ground-fault relay-pickup and time-delay settings.
- 2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
 - a. Device tag.
 - b. Voltage and current ratio for curves.
 - c. Three-phase and single-phase damage points for each transformer.
 - d. No damage, melting, and clearing curves for fuses.
 - e. Cable damage curves.
 - f. Transformer inrush points.
 - g. Maximum fault-current cutoff point.
- G. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC FLASH HAZARD STUDY

- A. Provide an arc flash hazard study for the new electrical distribution system equipment shown on the drawings. The intent of the study is to determine hazards that exist at each major piece of electrical equipment shown on the one line diagram. This includes, panelboards, switchboards, and transformers. Arch flash study shall not exclude equipment exempted by NFPA 70(E) and IEEE 1585, which allows exclusion of equipment that operates at 240 volts maximum and is fed from a transformer smaller than 125 kva. Study shall state the total number of arc flash labels (locations with calculations) that will be supplied. The study will include creation of arc flash warning labels listing all items required in NFPA 70(E) and IEEE 1585. The electrical contractor shall install the labels.

END OF SECTION 16100

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.

- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC; mineral-insulated, metal-sheathed cable, Type MI; nonmetallic, Type NM; Type SO and Type USE with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Minimum size: Minimum conductor size for power and lighting circuits shall be No. 12 AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Install cables in raceways, concealed in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Identify and color-code conductors and cables.
- E. Conductors for 20A branch circuiting of 120V, more than 75 feet long, (to the first fixture or other current-consuming outlet), and of 277V, more than 150 feet long (to the first fixture or other current consuming outlet) shall be No. 10 AWG, unless larger size indicated on drawings.
- F. Support all conductors in vertical raceways, as specified in Section 300-19 NEC.

3.4 CONNECTIONS

- A. 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.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: Perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 5. Electri-Flex Co.
 - 6. Manhattan/CDT/Cole-Flex.
 - 7. Maverick Tube Corporation.
 - 8. O-Z Gedney; a unit of General Signal.
 - 9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel or aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel or die-cast, compression type.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group.
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; a Hubbell Company.
 - 12. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type [1], unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type for interior use only.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Erickson Electrical Equipment Company.
 - 4. Hoffman.
 - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 6. O-Z/Gedney; a unit of General Signal.
 - 7. RACO; a Hubbell Company.
 - 8. Robroy Industries, Inc.; Enclosure Division.
 - 9. Scott Fetzer Co.; Adalet Division.
 - 10. Spring City Electrical Manufacturing Company.
 - 11. Thomas & Betts Corporation.
 - 12. Walker Systems, Inc.; Wiremold Company (The).
 - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- F. Hinged-Cover Enclosures: 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: Plastic.
- G. 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.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.

2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type **3R** unless otherwise noted.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
6. Raceways in slab: RNC or ENT

C. Minimum Raceway Size: 3/4-inch 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.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Properly support raceways.

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. 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.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Install raceway sealing fittings at suitable, approved, and accessible locations 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. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- L. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.
 - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- M. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, 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.
- N. 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.

- O. Install exposed raceways parallel or at right angles to nearby surfaces or structural members.
- P. Where raceways enter boxes or cabinets that do not have threaded hubs, raceways shall be secured in place with galvanized locknuts inside and outside of the enclosure, and shall have a bushing inside. All raceway ends, including those for empty conduits, shall have bushings.
- Q. Conduits leaving air handling units, fan coils, air conditioners, outside air units or any other pressurized tempered air moving equipment shall be sealed with **Ductseal #203**. The conduit is to be sealed inside of the junction box or as it leaves the equipment.
- R. Avoid installing boxes back to back in walls. Provide not less than 12 inches separation.
- S. Position recessed boxes accurately to allow for surface finish thickness.
- T. Secure boxes firmly and rigidly to substrates, or structural surfaces to which attached.

3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.4 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches and wall-box dimmers.
 - 3. Pendant cord-connector devices.
 - 4. Cord and plug sets.
 - 5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- 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 NFPA 70.

1.7 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V: Comply with NEMA WD 1, NEMA WD 6 configurations 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell HBL5362 series.
 - b. Leviton 5362 series.
 - c. Pass & Seymour PS5362 series.

2.2 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include power on indicator light and ground fault indicator light or reset lockout device.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pass & Seymour; 2095 series.
 - b. Hubbell; GFR5362 series.
- C. Weather-Resistant GFI Receptacles, 125V, 20A.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell GFR5362TR series.
 - b. Pass & Seymour 2095TRWR series.

2.3 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.
 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - b. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - c. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.6 WALL PLATES

- A. Single and combination types to match corresponding wiring devices
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material:

- a. Finished Spaces: Stainless Steel
 - b. Unfinished Spaces: Galvanized Steel
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, thermoplastic with lockable “WHILE IN USE” cover.

2.7 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Flanged with cable access ports or furniture feed connections per plans.
- D. Power Receptacle: As indicated on drawings
- E. Voice and Data Communication Outlet: As indicated on drawings

2.8 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices: White, unless otherwise selected by Architect, or unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. 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 the 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 just 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. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they 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, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the 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 on bottom, 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. Device plates shall be installed with all four edges in contact with finished wall surfaces.

G. 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.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Receptacles: Identify panelboard and circuit number from which served. Use machine printed labels with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

- B. Communications Outlets: Identify wiring closet and termination/port number for each jack. Use machine printed labels with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Properly ground all wiring devices.

3.4 FIELD QUALITY CONTROL

- A. 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 not acceptable.
 - 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. The 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.

END OF SECTION 16140

SECTION 16145 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Digital lighting controllers and relays.
 - 2. Standalone daylight-harvesting dimming controls.
 - 3. Indoor occupancy and vacancy sensors.
 - 4. Switchbox-mounted occupancy sensors.
 - 5. Digital timer light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
 - c. Photosensors.
 - d. Room Controllers and relays
 - 2. Interconnection diagrams showing field-installed wiring.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment will be attached.
 - 3. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.

- c. Speakers.
- d. Sprinklers.
- e. Access panels.
- f. Control modules.

- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. General Requirements for Sensors:
 - 1. Wall or Ceiling-mounted as indicated on drawings, solid-state indoor occupancy and vacancy sensors.
 - 2. Passive infrared, Ultrasonic and Dual technology.
 - 3. Low voltage with separate power pack, except where line voltage sensors are indicated on the drawings.
 - 4. Hardwired connection to switch.
 - 5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
 7. Sensor Output: Sensor is powered from the power pack.
 8. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 9. 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.
 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 11. Bypass Switch: Override the "on" function in case of sensor failure.
 12. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.
- B. PIR Type: detect occupants in coverage area by their heat and movement.
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, Ceiling Mounted): 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, Ceiling Mounted): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1200 square feet when mounted 48 inches (1200 mm) above finished floor.
- C. Ultrasonic Type: detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).
 6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1200 square feet when mounted 84 inches (2100 mm) above finished floor.
- D. Dual-Technology Type: detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- (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), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1200 square feet when mounted 48 inches (1200 mm) above finished floor.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V.
- B. Wall-Switch:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft (196 sq. m).
 2. Sensing Technology: Dual technology.
 3. Switch Type: SP, dual circuit where noted on plans. [manual "on," automatic "off."]
 4. Capable of controlling load in three-way application.
 5. Voltage: Dual voltage - 120 and 277 V.

6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
10. Color: White.
11. Faceplate: Color matched to switch.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

- A. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- B. Open looped analog photosensor: photosensor that measures the daylight contribution and reports to a room controller that can automatically switch or dim relays; part of a digital lighting control system and sends light level signals to control loads connected to dimming room controllers.
 1. Sensor Output: analog three wire powered by room controller or photo sensor controller
 2. Light-Level Monitoring Range: 1 to 1800 fc with adjustment levels within that range.
 3. Integration: Compatible with room controller's wall switches for manual override
- C. Electrical Components, Devices, and Accessories:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lux).

2.4 LIGHTING CONTROL SYSTEM COMPONENTS

- A. Control system consisting of, but not limited to, relays, graphic user interface, switch stations, enclosures, and miscellaneous components necessary for a complete, operable lighting control system.
- B. Room Lighting Controllers: Room lighting controllers shall have the following features:
 1. Plenum rated for mounting above accessible ceiling.

2. Line voltage (120/277 volt) relays and 0-10 volt dimming outputs as required.
3. Accept inputs such as occupancy sensors, low voltage switches, and daylight sensors.
4. Support energy saving manual ON, bi-level, tri-level and dimming control strategies.
5. Zero crossing circuitry for each relay for reliability and increased product life.
6. Capable of Bacnet interface with building automation system.
7. Options:
 - a. Relay Expansion Panels: Expands outputs from room controller to 4 to 8 additional relays. 0-10V dimming. Connected to room controller with Cat 5e.
 - b. Occupancy Sensor Module: Eight conditional occupancy sensor inputs per module. Provides power for occupancy sensors. Connected to room controller with Cat 5e.

C. Relays

1. Cat 5e connection to room controller
2. Dimming relay allows for 0-10v dimming. 100% dim level when room controller loses power.
3. Latching relay holds position with presence of power.
4. Able to be located 100 ft from room controller.
5. 16 amp load rating for use with LED lighting.
6. Emergency Option: Combination normal power control and UL 924 emergency shunt bypass relay device that will automatically bypass to emergency power to an ON state when normal power is lost. With normal power present the emergency portion will automatically track on/off state of the normal power load relay, switching the emergency powered relay on/off to match. 0-10V dimming shall be provided standard for these relays.

D. Digital Switch: Single or multi pushbutton switch station that connects to room controller with Cat 5e. Buttons are individually programmed to control lighting relay(s). Bluetooth option for programming and control.

E. Low Voltage Switch: Momentary contact for 12VDC. Push button, constant open, momentary closed. Connects to and powered from power pack.

F. Power Pack: Power packs power low voltage occupancy sensors and other control devices. Class 2 output power supplies suitable for parallel interconnection. Power packs are capable of switching lighting loads rated 20 amp, 120 or 277 volt.

2.5 OUTDOOR PHOTOELECTRIC SWITCHES

A. Description: Weatherproof, UV resistant for outdoor applications.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 0 to 1800 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Mounting: 1/2-inch (13-mm) threaded male conduit.
5. Connected to room controller.

2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 24 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. 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.

3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. 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.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Install in conduit. Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting relays.
- B. Label time switches and contactors with a unique designation.
- C. Provide engraved label for each button on digital and low voltage switches. Label shall reflect load controlled. Submit labeling for approval.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Operational Test: After installing controls and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. See Testing and Commissioning requirements in Part 3.9 of this section.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual

occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 LIGHTING CONTROL TESTING & COMMISSIONING

A. Documentation: The contractor shall provide the following

1. Report or test results submitted to the owner and engineer according to IECC 2021 Section C408.3.2.3.
 - a. The report of test results shall include the following:
 - 1) Results of functional performance tests.
 - 2) Disposition of deficiencies found during testing, including details or corrective measures used or proposed.
 - b. Submit report within 90 days of the date of receipt of the certificate of occupancy.
2. Manuals: Submit operating and maintenance manual that includes the following
 - a. Name and address of not less than one service agency for installed equipment
 - b. A narrative of how each system is intended to operate, including recommended setpoints.
 - c. Submittal data indicating all selected options for each piece of lighting equipment and lighting controls.
 - d. Operation and Maintenance manuals for each piece of lighting equipment. Required routine maintenance actions, cleaning and recommended relamping shall be clearly identified.
 - e. A schedule for inspecting and recalibrating all lighting controls.

B. Functional Testing: Prior to passing final inspection, evidence that the lighting control systems, hardware and software, has been tested, calibrated, adjusted, programmed, and are in proper working condition in accordance with the construction documents and manufacturer's instructions must be provided by the contractor.

1. Section C408.3.1.1 Where occupant sensor controls are provided, the following procedures shall be performed:
 - a. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.
 - b. For projects with seven or fewer occupant sensors, each sensor shall be tested.
 - c. For projects with more than seven occupant sensors, testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided, not less than 10 percent and in no case fewer than one, of each combination shall be tested unless the code official or design professional requires a higher percentage to be tested. Where 30 percent or more of the test controls fail, all remaining identical

combinations shall be tested. For occupant sensor controls to be tested, verify the following:

- 1) Where occupant sensor controls include status indicators, verify correct operation.
- 2) The controlled lights turn off or down to the permitted level within the required time.
- 3) For auto-on occupant sensor controls, the lights turn on the permitted level when an occupant enters the space.
- 4) For manual-on occupant sensor controls, the lights turn on only when manually activated.
- 5) The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

2. Section C408.3.1.2 Time-switch controls. Where time-switch controls are provided, the following procedures shall be performed:

- a. Confirm that the time-switch control is programmed with accurate weekday, weekend and holiday schedules.
- b. Provide documentation to the owner of time-switch controls programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
- c. Verify the correct time and date in the time switch.
- d. Verify that any battery back-up is installed and energized.
- e. Verify that the override time limit is set to not more than 2 hours.
- f. Simulate occupied condition. Verify and documents the following:
 - 1) All lights can be turned on and off by their respective area control switch.
 - 2) The switch only operates lighting in the enclosed space in which the switch is located.
- g. Simulate unoccupied condition. Verify and document the following:
 - 1) Nonexempt lighting turns off.
 - 2) Manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.
- h. Additional test as specified by the registered design professional.

3. Section C408.3.1.3 Daylight responsive controls. Where daylight responsive controls are provided, the following shall be verified:

- a. Control devices have been properly located, field calibrated and set for accurate setpoints and threshold light levels.
- b. Daylight controlled lighting loads adjust to light level setpoints in response to available daylight.
- c. The calibration adjustment equipment is located for ready access only by authorized personnel.

3.9 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 16145

SECTION 16231 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes packaged engine-generator sets for selected emergency power loads with the following features:
 - 1. Natural gas engine-generator.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Performance requirements.
 - 5. Remote Annunciator Panel

1.3 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
 4. Wiring Diagrams: Power, signal, and control wiring.
- C. Qualification Data: For installer and manufacturer.
- D. Source quality-control test reports.
1. Certified summary of prototype-unit test report.
 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:
1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
- G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
 2. Engineering Responsibility: Preparation of data for vibration isolators of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. 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.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

- D. 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.
- E. Comply with ASME B15.1.
- F. Comply with NFPA 37.
- G. Comply with NFPA 70.
- H. Comply with NFPA 99.
- I. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- J. Comply with UL 2200.
- K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- L. 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.

1.6 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).

1.7 COORDINATION

- A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases.

1.8 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: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Caterpillar; Engine Div.
 - 2. Onan/Cummins Power Generation; Industrial Business Group.

2.2 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.
 - 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.
 - 4. Compatible with Uninterruptible Power Supplies (UPS).
- D. Generator-Set Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.25 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 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 2 percent total with no slot ripple. 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 300 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.

9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear loads. Provide permanent magnet excitation for power source to voltage regulator.

2.3 ENGINE

- A. Fuel: Natural Gas
- B. Rated Engine Speed: 1800 rpm.
- C. 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.
- D. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- E. Governor: Adjustable isochronous, with speed sensing.
- F. 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. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- G. Muffler/Silencer: Critical 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 25 dB at 500 Hz.
 2. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after installation is complete shall be 85 dBA or less.

- H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- I. Starting System: 12 or 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.
 - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 - 4. Battery: Adequate capacity within ambient temperature range to provide specified cranking cycle at least three times without recharging.
 - 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 - 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
 - 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
 - 8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: Mounted in enclosure in generator enclosure.

2.4 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. Operation of a remote emergency-stop switch also shuts down generator set.

- B. Engine-Generator Set Controls: The generator set shall be provided with a microprocessor-based control system, which is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall allow local monitoring and control, and remote monitoring and control where indicated. The control shall be UL508 labeled and CSA282-M1989 certified. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts. The entire control shall be tested and meet the requirements of IEEE587 for voltage surge resistance.
- C. Configuration: Operating and safety indications, protective devices, local 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 1 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. Fuel tank derangement alarm.
 - 11. Fuel tank high-level shutdown of fuel supply alarm.
 - 12. 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.
- F. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals.
- G. Remote Alarm Annunciator: An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for Level 1 systems, and in addition shall provide indications for high battery voltage, low battery voltage, and loss of normal power to the charger. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate shall be flush-mounting type.

2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
 - 1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
 - 2. Trip Settings: Selected to coordinate with generator thermal damage curve.
 - 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.
 - 5. Quantity: Two, rating as indicated on drawings.
- B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:
 - 1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
 - 2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 - 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
 - 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.6 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. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- J. Subtransient Reactance: 12 percent, maximum.

2.7 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Vandal-resistant, sound attenuated Level 2, weatherproof steel housing, wind resistant up to 150 mph. 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.

2.8 VIBRATION ISOLATION DEVICES

- A. 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.

2.9 FINISHES

- A. Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.10 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.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Full load run.
 - 3. Maximum power.
 - 4. Voltage regulation.
 - 5. Transient and steady-state governing.
 - 6. Single-step load pickup.
 - 7. Safety shutdown.
 - 8. Report factory test results upon completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 restrained spring isolators having a minimum deflection of 1 inch (25 mm) on 4-inch- (100-mm-) high concrete base. Secure sets to anchor bolts installed in concrete bases.

- 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 15.
 - 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 15.
- E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

- A. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- B. Connect cooling-system water piping to engine-generator set with flexible connectors.
- C. Connect engine exhaust pipe to engine with flexible connector.
- D. Connect fuel piping to engines with a gate valve and union and flexible connector.
- E. Properly ground generator and related equipment.

3.4 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,
 - a. Single-step full-load pickup test.
 - b. Two hour full load test using resistive load bank. Contractor shall provide load bank and connections.
 - c. Test local and remote control panels.
 - d. Simulate engine shutdowns.
 - 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. 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.
 8. 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.
 9. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
- D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- J. 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.

- K. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 DEMONSTRATION

- A. Provide 8 hours of Owner training for Emergency Power and Transfer Systems.

END OF SECTION 16231

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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.
- D. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: 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, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. 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.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. 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.

- F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- H. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, 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.

2.4 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. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.

- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. 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.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Infrared Scanning: Perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

- C. 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.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Division 16 Section "Overcurrent Protective Device Coordination".

END OF SECTION 16410

SECTION 16413 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes electricity metering for electrical equipment.
- B. The contractor shall furnish, install, and test the electricity metering system as noted on the electrical plans, and as specified herein.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. For each type of meter.
 - 2. For metering infrastructure components.
 - 3. For metering software.
- B. Shop Drawings: For electricity-metering equipment.
 - 1. Include diagrams for power, signal, and control wiring.
 - 2. Wire Termination Diagrams and Schedules: Include diagrams for power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
 - 3. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices used. Describe characteristics of network and other data communication lines.
- C. Qualification Data: For testing agency.
- D. Warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: In addition to items specified in Division 01, include the following:
 - 1. Application and operating software documentation.
 - 2. Software licenses.
 - 3. Software service agreement.
 - 4. Device address list.
 - 5. Hard copies of manufacturer's operating specifications, user's guides for software and hardware, and PDF files on a USB storage device of hard-copy Submittal.
 - 6. Meter data sheet for each meter, listing nameplate data and serial number, accuracy certification, and test results.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
- B. Conform to requirements of ANSI C12.1 & NFPA 70, Article 100
- C. Products shall be listed and/or recognized by UL or ETL.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metering equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Damage from transient voltage surges.
 - 2. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Equipment for Electricity Submetering
 - 1. Packet Power
 - a. Single Electricity meter: Packet Power MP277-3MV, MP277-8RO, and MP480-6MV.
 - b. Multi-Circuit Electricity meter: Packet Power BGS16, BGS32, and BGS72.
 - c. Branch Circuit Electricity meter: Packet Power BGP64, BGP128, and BGP192.
 - d. Ethernet Gateway (GW04 series)

2. Approved Equal

- B. Kilowatt-Hour/Demand Meter: Electronic single- and three-phase meters, measuring electricity use and demand.
1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
 2. Display: OLED, indicating accumulative kilowatt hours, current demand, and current load.
 3. Communication interface
 - a. Web-based user interface to allow review of real time data and enable mass firmware updates.
 - b. 3rd party integration via supported protocols (SNMP, Modbus TCP, BACnet, MQTT)
 4. Current Transformers: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for ratings of circuits indicated for this application.
 - a. Split-core current transformers or Rogowski coils with output of 333mV available for 15-10,000A.
 - b. Shunted and individually replaceable via Molex quick disconnect.
 - c. Wire lead lengths are customizable and can be extended up to 100'.

2.2 SINGLE ELECTRICITY METER

- A. Provides metering of a single circuit for 1P/2W, 2P/3W, 3P/3W, and 3P/4W loads.
- B. Meters must be capable of metering all voltage types up to 480V L-L.
- C. Metering units must be capable of metering loads between 15A and 10,000A.
- D. System accuracy must be +/- 1% or less.
- E. Electrical failure powering the device shall not result in a loss of energy cumulation.
- F. Metering units support custom CT lead lengths and pre-configured wire harnesses.

2.3 MULTI-CIRCUIT ELECTRICITY METER

- A. Provides metering for 1-72 poles for 1P/2W, 2P/3W, 3P/3W, and 3P/4W loads.
- B. Metering units must be configurable to meter 72 single-pole circuits, 36 two-pole circuits, or 24 three-pole circuits.
- C. Metering units must be configurable to meter 32 single-pole circuits, 16 two-pole circuits, or 10 three-pole circuits.
- D. Metering units must be configurable to meter 16 single-pole circuits, 8 two-pole circuits, or 5 three-phase circuits.

- E. Meters must be capable of metering all voltage types up to 480V L-L.
- F. Metering units must be capable of metering loads between 15A and 10,000A.
- G. System accuracy must be +/- 1% or less.
- H. Electrical failure powering the device shall not result in a loss of energy cumulation.
- I. Metering units support custom CT lead lengths and pre-configured wire harnesses

2.4 BRANCH CIRCUIT ELECTRICITY METER

- A. Provides metering for 32-192 poles for 1P/2W, 2P/3W, 3P/3W, and 3P/4W loads.
- B. Metering units must be configurable to meter 192 single-pole circuits, 96 two-pole circuits, or 64 three-pole circuits.
- C. Metering units must be configurable to meter 128 single-pole circuits, 64 two-pole circuits, or 42 three-pole circuits.
- D. Metering units must be configurable to meter 64 single-pole circuits, 32 two-pole circuits, or 21 three-pole circuits.
- E. Meters must be capable of metering all voltage types up to 480V L-L.
- F. Metering units must be capable of metering loads between 15A and 10,000A.
- G. System accuracy must be +/- 1% or less.
- H. Electrical failure powering the device shall not result in a loss of energy cumulation.
- I. Metering units support custom CT lead lengths and pre-configured wire harnesses

2.5 SYSTEM MEASUREMENTS - SINGLE METER, MULTI-CIRCUIT, BRANCH CIRCUIT

- A. Voltage (V) - all phases
- B. Amperage (A) - all phases
- C. Real Power (W) - all phases
- D. Apparent Power (VA)

- E. Energy (Wh) - per phase and total
- F. Voltage and Current Phase Angle
- G. Frequency (Hz)
- H. Power Factor (PF)

2.6 METER COMMUNICATIONS AND DATA COLLECTION

A. The Systems shall be as described below:

1. Consists of wireless communication enabled electricity meters, Ethernet Gateway collection device.
2. Web based software
 - a. Software package shall be web based with no limit to the number of users.
 - b. Cloud based software is fully functional without software other than standard web browsers including, but not limited to, Internet Explorer, Google Chrome, and Firefox.
 - c. Software shall support an unlimited number of metering points but are billed on a per device basis.
 - d. Software shall have the ability to define circuits and display friendly names.
 - e. Software shall be used for the collection, analysis, and reporting of energy data
3. Third party software used to collect and display data or to allow all data collected to IP based applications including third party software such as DCIM, BMS, and billing systems.
4. Data Acquisition Device
 - a. The data acquisition device can be used to verify real-time data from electricity meters.
 - b. Device shall operate under the following conditions: 32° to 104°F (0° to 40°C); 10% to 90% non-condensing
 - c. The device shall use modem and/or Ethernet connections for internet access allowing either static IP or DHCP.
5. No consumer grade protocols such as WiFi, Bluetooth, Zigbee, etc. shall be permitted for wireless data transmission due to security and performance factors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Wiring Method:

1. Minimum conduit size shall be 1/2 inch (13 mm).

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 1. Equipment and Software Setup:
 - a. Set meter date and time clock.
 - b. Test, calibrate, and connect pulse metering system.
 - c. Set and verify billing demand interval for demand meters.
 - d. Report settings and calibration results.
 - e. Set up reporting and billing software, insert billing location names and initial constant values and variable needed for billing computations.
 2. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
 3. Turn off circuits supplied by metered feeder and secure them in off condition.
 4. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
 5. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.
 6. Generate test report and billing for each tenant or activity from the meter reading tests.
- C. Electricity metering will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.3 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for one year.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's clerical and maintenance personnel to use, adjust, operate, and maintain the electronic metering and billing software.

END OF SECTION 16413

SECTION 16415 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. 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.
 - 1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
- C. Qualification Data: For manufacturer.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

- B. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, and nonautomatic transfer switches through one source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NEMA ICS 1.
- E. Comply with NFPA 70.
- F. Comply with NFPA 99.
- G. Comply with NFPA 110.
- H. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Contactor Transfer Switches:
 - a. Onan/Cummins Power Generation; Industrial Business Group. (OTEC series Basis of Design)
 - b. Caterpillar; Engine Div.
 - c. Emerson; ASCO Power Technologies, LP.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 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 Terminal: Solid and fully rated, unless otherwise indicated.
- H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Provide color-coding and wire and cable tape markers.
 - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.
- E. 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 and two normally closed, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac. Auxiliary contacts shall be used to signal shunt trip circuit breakers and BMS.
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: 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.
12. 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.

2.4 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. Wall-mounting Switch: Bolt units to wall or mount on lightweight structural steel channels bolted to wall. For units not located at walls, provide freestanding structural steel support rack.
- B. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

- A. Properly ground equipment.

3.3 IDENTIFICATION

- A. Enclosure Nameplate: Label each enclosure with engraved laminated plastic nameplate.

3.4 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 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. Include external annunciation and control circuits. 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. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - 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.
- B. Coordinate tests with tests of generator and run them concurrently.
- C. 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.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. 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. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. 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.

END OF SECTION 16415

SECTION 16440 – SURGE PROTECTION DEVICES

PART 1 – GENERAL

1.1 DESCRIPTION / SCOPE

- A. Surge Protection Devices per UL1449 4th Edition.
- B. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devices.

1.2 QUALITY ASSURANCE

- A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
 - 1. UL 1449 4th Edition 2014 Revision (effective 3/26/2016).
 - 2. UL 1283.
 - 3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - 4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
 - 5. UL96A
 - 6. IEEE 1100 Emerald Book.
 - 7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.3 WARRANTY

- A. Warranty on defective material and workmanship shall be for 10 years.
- B. Copy of warranty to be sent with submittal.

1.4 SUBMITTALS / QUALITY ASSURANCE – SUBMIT THE FOLLOWING

- A. Package must include shop drawings complete with all technical information, unit dimensions, detailed installation instructions, maintenance manual, recommended replacement parts list and wiring configuration.
- B. Copies of manufacturer's catalog data, technical information and specifications on equipment proposed for use.
- C. Copies of documentation stating that the Surge Protective Device is listed by UL to UL1449 4th Edition, category code VZCA.
- D. Copies of actual let through voltage data in the form of oscillograph results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.
- E. Copies of Noise Rejection testing as outlined in NEMA LS1-1992 (R2000) Section 3.11. Noise rejection is to be measured between 50 kHz and 100 MHz verifying the devices noise attenuation. Must show multiple attenuation levels over a range of frequencies.
- F. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.
- G. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

PART 2—PRODUCTS

2.1 APPROVED MANUFACTURER

- A. Basis of design is Current Technology

Submission for prior approval package must be received by engineer two weeks prior to bid date and shall fully comply with all performance characteristics included in this specification.

Approval submissions must include test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor (model being submitted) can survive the published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.

2.2 MANUFACTURED UNITS / ELECTRICAL REQUIREMENTS

- A. Refer to drawing for operating voltage, configuration and surge current capacity per mode for each location.

- B. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449, section 37.7.3. MCOV values claimed based on the component's value or on the 30-minute 115% operational voltage test, section 38 in UL1449 will not be accepted.
- C. Unit shall have no more than 10% deterioration or degradation of the UL1449 4th Edition Voltage Protection Rating (VPR) when exposed to a minimum of 5,000 for the TG3 series repeated category C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.
- D. Protection Modes UL1449 4th Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave 6kV, 500A	C3 Comb. Wave 20kV, 10kA	UL 1449 Fourth Edition VPR Rating
120/240, 120/208	L-N	150	490	980	700
	L-G	150	570	980	700
	N-G	150	640	1170	700
	L-L	300	500	1600	1200
277/480	L-N	320	450	1420	1200
	L-G	320	540	1540	1200
	N-G	320	570	1600	1000
	L-L	552	530	2600	2000

- E. Electrical Noise Filter: each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
- SPD shall include a EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.
- F. The unit shall be able to withstand multiple TOVs without damage to the MOVs by shunting current away from the MOVs during the overvoltage. SPD must have the ability to withstand >100 TOVs with a source current of 30A, duration of 30 cycles, with 10s between TOV events.
- G. Integral Disconnect Switch (IF REQUIRED)
- The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
 - The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.

3. The switch shall be rated for 600Vac.
 4. The SPD device shall be tested to UL1449 4th Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.
 5. The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
 6. The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.
- H. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.
- I. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA
- J. The SCCR rating of the SPD shall be 200kAIC without the need for upstream over current protection.
- K. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.
1. The Service Entrance SPD shall have the following monitoring options included.

Time Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase)
 2. All SPDs monitoring shall track surge protection and display it as a percentage
 3. All SPDs shall provide a surge counter with three categories to be defined as Low Level surge (100A-500A), Medium Level surge (500A-3,000A), High Level surge (>3,000A)

PART 3—EXECUTION / INSTALLATION

- 3.1 The SPD manufacturer's technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
- A. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
 - B. Verify N-G connection.
 - C. Record information to a product signature card for each product installed.
- 3.2 If installed lead length exceeds 5' installer shall use a low impedance (HPI) cable to reduce the lead lengths effect on the installed performance of the SPD.

- 3.3 Do not work on branch circuits or panelboard with SPD connected to the panel with a closed circuit breaker. Circuit breaker feeding the SPD will need to be opened to conduct the work. Close circuit breaker when the work is completed.

END OF SECTION 264313

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Distribution panelboards

1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. 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. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
- C. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

- D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces.

Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface-mounted cabinets as indicated.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 1.
 - b. Outdoor Wet Locations: NEMA 3R.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder or metal frame with transparent protective cover.
- B. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- C. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
- D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- E. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Circuit breaker or Lugs only.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. 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.

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: Integral communication module with functions and features compatible with power monitoring and control system specified in Division 16 Section "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. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 - h. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - i. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
 - j. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
- C. 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.
- D. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Install filler plates in unused spaces.
- F. For multiple section panelboards, route a full sized grounding conductor with the phase conductors in raceway from ground bus to ground bus. Metal to metal cabinet grounding is not solely sufficient. The bus rating shall be continuous through each section, not tapered or diminished in size or rating. Cable from one section to another shall be full capacity and not reduced.
- G. Circuit breakers installed in existing panelboards shall be of the proper type to be installed therein, shall include bussing kits/alterations as required, and shall have an interrupting capacity of not less than that of the existing circuit breakers. Where circuit breakers are not available to fit the existing panelboard, the panelboard shall be removed and replaced with new.

3.3 IDENTIFICATION

- A. Circuit Number Labels: Provide labels to identify the circuit number. Locate label adjacent to circuit breaker or circuit breaker space.
- B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

- C. Panelboard Nameplates: Label each panelboard with engraved laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. 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.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Infrared Scanning: Perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- C. Panelboards will be considered defective if they do not pass tests and inspections.

- D. 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.

3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

SECTION 16491 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, and descriptions of individual components.
- B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.
 - 1. Ambient temperature adjustment information.
 - 2. Current-limitation curves for fuses with current-limiting characteristics.
 - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
 - 4. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc. LP Series.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc. AMP Trap 2000 Series.
 - 4. Littelfuse, Inc. LLS-RK Series.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay over 600A otherwise Class RK1, time delay.
2. Feeders: Class L, time delay over 600A otherwise Class RK1, time delay.
3. Motor Branch Circuits: Class RK1, time delay.
4. Other Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- #### A.
- Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 16491

SECTION 16511 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast, including BF.
 - 4. Energy-efficiency data.
 - 5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture

type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
 - b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom lighting fixtures. 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.
- C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.
- D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.
- 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.
- D. Comply with NFPA 70.
- E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Warranty Period for Emergency Fluorescent Ballast Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Refer to Lighting Fixture Schedule on plans for fixture types. These light fixtures are the basis of design. Substitutions will be considered where all aspects of the light fixture (ie, performance, aesthetics, lumen output and input wattage, mounting, etc) are considered equal as judged by the Architect, Lighting Designer and/or Engineer.
- B. LED Luminaires shall also meet the following minimum requirements:
 - 1. Luminaires shall have 5 year manufacturer's warranty
 - 2. Luminaires shall have a minimum L70 lumen maintenance value of 50,000 hours as calculated by IES TM-21, with data obtained per IES LM-80 requirements.
 - 3. Luminaire drive current value shall be identical to that provided by test data for luminaire in question.
 - 4. Luminaires shall be tested to IES LM-79 and IES LM-80 standards.
- C. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- 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.
- G. 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.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended drivers. 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 characteristics:
 - a. CCT and CRI for all luminaires.

2.2 LED DRIVERS

- A. NEMA SSL, UL 8750. LED drivers shall be electronic, UL Class 1, constant-current type and comply with the following requirements,
1. Output power (watts) and luminous flux (lumens) as shown or indicated in lighting fixture schedule for each luminaire type
 2. Power factor greater than or equal to 0.9 over the full dimming range when provided.
 3. Current draw total harmonic distortion (THD) of less than 20 percent.
 4. Class A sound rating
 5. Operable input voltage of 120-277 volts at 60 hz, unless noted otherwise.
 6. Minimum 5 year manufacturer's warranty.
 7. Integral thermal protection that reduces or eliminates the output power if the case temperature exceeds a value detrimental to the driver.
 8. UL listed for locations where the luminaire is installed.
 9. Where required, dimmable using 0-10V control or control as indicated in lighting fixture schedule.

2.3 LED LIGHT SOURCES

- A. Correlated Color Temperature as indicated in lighting fixture schedule.
- B. CRI: minimum value of 80
- C. RoHS compliant
- D. Provide light source color consistency by utilizing a binning tolerance within a 4 step McAdam ellipse. Color temperature variations will not be accepted.

2.4 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. 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.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 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: LEDs, 50,000 hours minimum rated lamp life.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "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. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm)
- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. 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:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Wall-Mounted Luminaires:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

E. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least two independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

F. 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.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and generator and retransfer to normal.
- B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
- C. 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.
- D. Adjustments: When requested within 12 months of the date of substantial completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to project during other than normal hours for this purpose. Some of the work may be required during hours of darkness.

END OF SECTION 16511

SECTION 16700 - TELECOMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mounting Elements.
 - 2. UTP Cabling.
 - 3. Fiber-Optic Cabling.
 - 4. Workstation Outlets.
 - 5. Equipment Cabinets.
 - 6. Patch Panels.
 - 7. Backboards.
 - 8. Identification Products.
- B. The existing campus IT vendor is,

L&J Technology LLC
1100 Poydras St, Suite 2175
New Orleans, LA 70163

1.3 DEFINITIONS

- A. Backbone: A facility (e.g., pathway, cable, or conductors) between telecommunications rooms or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.
- B. BICSI: Building Industry Consulting Service International.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic Interference.
- E. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal cross-connect.

- F. IDC: Insulation Displacement Connector.
- G. LAN: Local Area Network.
- H. RCDD: Registered Communications Distribution Designer.
- I. UTP: Unshielded Twisted Pair.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connections.
 - 2. System Labeling Schedules: Copy of labeling schedules.
 - 3. Overall system block diagram.
- C. Qualification Data: For installer, testing agency and field inspector.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.
 - 1. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
 - 1. Testing Agency's Field Supervisor: Person currently certified by BICSI as an RCDD to supervise field quality-control testing.

- 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.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

1.7 WARRANTY

- A. Minimum five years for parts and labor on all cable and connectors.

1.8 COORDINATION

- A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications department. Coordinate service entrance arrangement with local exchange carrier.
 - 1. Meet jointly with Owner's telecommunications department to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings.
 - 3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum performance.

2.2 PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- B. Cable Trays:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cablofil Inc.
 - b. Cooper B-Line, Inc.

- c. Chatsworth
 - d. Cope - Tyco/Allied Tube & Conduit.
 - 2. Cable Tray Materials: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than **0.000472 inch (0.012 mm)** thick.
 - a. Cable Runway: made of 3/8" x 1-1/2" x .065" rectangular steel tubing. Size as indicated on drawings, and a rung spacing of **12 inches**.
 - 3. Provide a minimum of 12" clearance above all cable trays for future access.
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
- 1. Outlet boxes shall be two-gang unless noted otherwise on drawings.

2.3 MOUNTING ELEMENTS

- A. Backboards: Interior-grade, void free plywood, fire-retardant treated, 3/4 by 48 by 96 inches.
- B. Floor mounted distribution racks: Freestanding, modular steel units designed for telecommunications terminal support with four posts.
 - 1. 2 post, width compatible with EIA 310 standard 19-inch panel mounting.
 - 2. Finish: Baked-polyester powder coat.
- C. UPS: Provide uninterruptible power supply, 120 volt input, 120 volt output for equipment. Features shall include automatic self test, automatic voltage regulation, building wiring fault indicator, intelligent battery management, load meter, network-grade line conditioning, full time multi-pole noise filtering (0.3% IEEE surge let-through and zero clamping response time meeting UL 1449), overload indicator, replace battery indicator, sine-wave output, status indicator LED's, audible alarms, output receptacles, and user replaceable batteries. UPS shall have one available smart slot interface. Surge energy rating shall be 800 joules. Batteries shall be maintenance-free sealed lead-acid type with suspended electrolyte. UPS shall be rack mounted.

2.4 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Belden CDT Inc.; Electronics Division.
 - 2. Berk-Tek; a Nexans company.
 - 3. CommScop, Inc.
 - 4. Hubbell
 - 5. Mohawk; a division of Belden CDT.
 - 6. Superior Essex Inc.

- B. General Description: 100-ohm, 4-pair UTP, covered with a thermoplastic jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.1-2000 for performance specifications.
 - 3. Comply with TIA/EIA-568-B.2, Category 6.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444.
- C. Horizontal Copper Cable (Data):
 - 1. No. 23 AWG, 4 pair, category 6.
 - 2. NFPA 70, types CMG and CMP.
 - 3. Cable Jacket Color: Blue (Data), Yellow (WAP), Green (Camera), Access Control (black).

2.5 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hubbell Premise Wiring.
 - 2. Leviton Voice & Data Division.
 - 3. Simon Co. (The).
 - 4. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables. Comply with TIA/EIA-568-B.2, meeting or exceeding cable performance.
 - 1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
 - 2. Label each port to match workstation labeling.
- E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- F. Patch Cords: Factory-made, four-pair cables in lengths as indicated on drawings; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall be color-coded to match system cable; Blue (Data), WAP (yellow), Camera (Green).
3. Provide a 1 meter patch cord for each wired port.

2.6 FIBER-OPTIC CABLING

A. Available Cable, Terminal, and Connector Product Manufacturers:

1. Corning Cable systems
2. General Cable Technologies Corporation
3. Superior Essex

B. Fiber-Optic Cable: 9/125-micron, single mode optical fiber meeting OS2 specifications.

C. Backbone Fiber Cable:

1. Comply with TIA/EIA-492AAAA, loose tube, gel free, indoor/outdoor.
2. NFPA 70, Type OFN complying with UL 1666.
3. Maximum Attenuation: 0.4/0.25 dB/km at 850/1300 nm.
4. Minimum Modal Bandwidth: 100 Terahertz at 850/1300 nm.
5. Cable Jacket Color: Yellow.

D. Cross-Connect and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy expansion criteria.

E. Patch Cords: Factory-made, dual fiber cables in 3 meter lengths.

F. Cable Connecting Hardware:

1. Comply with TIA/EIA-568-B.3.
2. Quick-connect, Type LC termination. Insertion loss not more than 0.7 dB. Contractor shall verify connector types with WWII IT department prior to ordering equipment.

2.7 COMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Unless indicated otherwise, two-port connector assemblies mounted in two gang device box with faceplate.

1. Faceplate: Stainless Steel.

2. Mounting: Flush, unless otherwise indicated.
3. Legend: Label each jack using BISCII labeling guidelines.

2.8 GROUNDING

- A. Comply with ANSI-J-STD-607-A..

2.9 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables according to TIA/EIA-568-B.2.
- C. Fiber Optic Cable: Each cable stool tested at factory before shipping at 850 and 1300nm.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

2.11 SURGE PROTECTION

- A. Protect components from voltage surges originating external to equipment housing and entering through power, communication or control leads. There is to be two levels of protection as follows:
 1. All incoming 120 volt circuits.
 2. Protect communication and control, and low voltage power lines as they leave the control box and route to another separate building and as they enter the control box in the other separate building.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways except within equipment cabinets, and except in accessible ceiling spaces. Cabling installed above accessible ceilings, and not in raceway, shall be supported every 5' using J-Hooks through the building structure. Bundle cables of like systems together using Velcro straps. Raceways shall be provided in walls, in spaces with exposed ceilings, and in inaccessible ceiling areas. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- C. All fiber optic cabling installed within the building shall be armored or ran in orange innerduct.

3.3 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- C. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits 3 inches above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- D. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.
- E. Prepare wall penetrations and verify the penetrations of fire rated walls are made using products labeled for use of wall penetrations.

3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.

2. Comply with BICSI ITSIM, Ch. 6, “Cable Termination Practices.”
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer’s limitations on bending radii, but not less than radii specified in BICSI ITSIM, “Cabling Termination Practices” Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. At communication outlets, install a loop in each cable within the box before making the final termination.
11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, “Pulling Cable.” Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than ½ inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

- a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, “Grounding, Bonding, and Electrical Protection” Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar in each communications closet to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment (cable runway, equipment racks, etc) to the grounding bus bar, using not smaller than No. 4 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A.
- B. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Furnish an electronic copy to the Owner of final comprehensive schedules for Project.

- C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
- D. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Communications Outlets: Identify wiring closet and termination/port number for each jack. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, durable wire markers or tags inside outlet boxes.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
 - 1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform test with a tester that complies with performance requirements in “Test Instruments (Normative)” Annex, complying with measurement accuracy specified in “Measurement Accuracy (Informative)” Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
4. UTP Performance Tests:
 - a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Wire Map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
5. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Prepare test and inspection reports.
- D. Fiber-Optic Cable Tests:
 1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Link End-to-End Attenuation Tests:
 - a. Horizontal and singlemode backbone link measurements: Test at 1310 or 1550 nm in 1 direction according to TIA/EIA-526-14-A.
 - b. Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- E. Remove and replace cabling where test results indicate that they do not comply with specified requirements. Retest and inspect replaced cabling to determine compliance with specifications.

END OF SECTION 16700

SECTION 16721 - FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Noncoded, microprocessor-based, digital-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.
 - 1. Interface with existing fire alarm system in theater building. New system shall be compatible with and of the same manufacture as the existing system.
 - 2. The fire alarm system shall be networked with the existing system via communication link. The fire alarm system shall be capable of functioning as a stand-alone system should the communication link fail.
 - 3. Provide all hardware, software and programming necessary for the new and existing systems.
- B. The existing campus fire alarm system vendor is,

ADS Systems
30 Veterans Memorial Blvd
Kenner, LA 70062
(504)471-0917

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Provide submittal for State Fire Marshal review.
2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- 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.
- D. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

PART 2 - PRODUCTS

2.1 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 1. Manual stations.
 2. Heat detectors.
 3. Smoke detectors.
 4. Duct smoke detectors.
 5. Automatic sprinkler system water flow.
 6. Heat detectors in elevator shaft and pit.
- B. Fire-alarm signal shall initiate the following actions:
 1. Continuously operate alarm notification appliances.
 2. Identify alarm at fire-alarm control unit and remote annunciator.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Release fire and smoke doors held open by magnetic door holders.
 5. Recall elevators to primary or alternate recall floors.
 6. Activate emergency shutoffs for gas and fuel supplies.
 7. Record events in the system memory.
 8. Record events by the system printer.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 1. Valve supervisory switch.
 2. Elevator shunt-trip supervision.

- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at fire-alarm control unit.
 4. Ground or a single break in fire-alarm control unit internal circuits.
 5. Abnormal ac voltage at fire-alarm control unit.
 6. Break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at fire-alarm control unit or annunciator.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.2 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
1. The control panel shall include all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel shall be designed such that interactions between any applications can be configured, and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel. Control panel shall be networkable and communicate with existing facility control panels.
 2. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
 - a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
 3. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
 4. Addressable control circuits for operation of mechanical equipment.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
 - a. Initiating Device Circuits: Style D.
 - b. Notification Appliance Circuits: Style Z.
 - c. Signaling Line Circuits: Style 6.
 - d. Install no more than 98 addressable devices on each signaling line circuit.
2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
 - a. Initiating Device Circuits: Style C.
 - b. Notification Appliance Circuits: Style Y.
 - c. Signaling Line Circuits: Style 4.
3. Serial Interfaces: Two RS-232 ports for printers.
4. Actuation of alarm notification appliances, emergency voice communications, annunciation, elevator recall, and actuation of suppression systems shall occur within 10 seconds after the activation of an initiating device.

D. Notification Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

E. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station. Monitoring shall be accomplished via existing main fire alarm control panel.

G. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall.
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
 3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- H. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators in a separate enclosure.
1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
 - a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
 - d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.
 2. Status Annunciator: Indicate the status of various voice/alarm speaker zones.
 3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
1. Batteries: Sealed lead calcium.
- K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

- L. AHU Shutdown Sequence: The activation of any duct-mounted smoke sensor shall cause the associated air handling unit to be shut down.
- M. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.
- N. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP after initiating devices are restored to normal.
- O. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.
- P. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.
 - 1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.
- Q. Surge Protection:
 - 1. Install surge protection on normal ac power for the FACP and its accessories.
 - 2. Install surge protectors recommended by FACP manufacturer. Install on all system circuit wiring external to the building housing the FACP.

2.3 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.

2.4 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Detectors shall be two-wire type.
 - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
 - c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.5 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. Voice/Tone Notification Appliances:
 - 1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 - 2. High-Range Units: Rated 2 to 15 W.
 - 3. Low-Range Units: Rated 1 to 2 W.
 - 4. Mounting: Flush.
 - 5. Matching Transformers: Tap range matched to acoustical environment of speaker location.
 - 6. Color: White
- C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.
 - 6. Mounting Faceplate: Factory finished, white.
- D. Combination speaker/strobes: Appliance shall combine the features of both speakers and strobes in single device.

2.6 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Mounting: Flush, semi-recess cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.7 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

- B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.

2.8 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both telephone lines are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.
 - 3. Address of the trouble-initiating device.
 - 4. Loss of ac supply or loss of power.
 - 5. Low battery.
 - 6. Abnormal test signal.
 - 7. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Provide two cat 6 telephone cables to telephone demark for remote monitoring.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.

2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt trip breaker.
10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
11. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. Tests and Inspections:
 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

END OF SECTION 16721

SECTION 16723 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes intrusion detection with communication links to perform monitoring, alarm, and control functions.
 - 1. The intrusion detection system is an extension of the existing system in the theater building. The new system shall be fully compatible with the existing system, and shall be capable of performing as a stand-alone system should the communication link with the existing system fails.
 - 2. The new system devices and equipment shall match the existing building standard. The new system shall be compatible with Genetec software
 - 3. The existing campus security system vendor is,
RAE Security
21399 Marion Lane, Suite E
Mandeville, LA 70471
(713) 589-2594

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
 - 1. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
 - 2. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
 - 3. Master Control-Unit Console Layout: Show required artwork and device identification.
 - 4. Device Address List: Coordinate with final system programming.
 - 5. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
 - 6. Details of surge-protection devices and their installation.
 - 7. Sensor detection patterns and adjustment ranges.
- C. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.
- D. Field quality-control reports.

- E. Operation and maintenance data.
- F. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
 - 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
- 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.
- D. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.
- E. FM Global Compliance: FM-Approved and -labeled intrusion detection devices and equipment.
- F. Comply with NFPA 70.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Description: Multiplexed, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.
- B. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
 - 1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.

2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
 3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.
- C. System Control: Master control unit shall directly monitor intrusion detection units and connecting wiring.
- D. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.
- E. Response Time: Two seconds between actuation of any alarm and its indication at master control unit.
- F. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.
- G. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.
- H. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

2.2 SYSTEM COMPONENT REQUIREMENTS

- A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."
 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.
- B. Intrusion Detection Units: Listed and labeled by a qualified testing agency for compliance with UL 639.
- C. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V rms injected into power supply lines at 10 to 10,000 MHz.

- D. Tamper Protection: Tamper switches on detection devices, control units, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Master control-unit alarm display shall identify tamper alarms and indicate locations.
- E. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.
- F. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.
- G. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to master control unit.
- H. Remote-Controlled Devices: Individually and remotely adjustable for sensitivity and individually monitored at master control unit for calibration, sensitivity, and alarm condition.

2.3 SECURE AND ACCESS DEVICES

- A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.
- B. Key-Operated Switch: Change protected zone between secure and access conditions.

2.4 DOOR AND WINDOW SWITCHES

- A. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of two encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.
- B. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.
- C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounted magnet and floor-mounted switch unit.

2.5 PIR SENSORS

- A. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.
- B. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.
 - 1. Wall-Mounted Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet (15 m).

2. Ceiling-Mounted Unit Spot-Detection Pattern: Full 360-degree conical.
3. Ceiling-Mounted Unit Pattern Size: 84-inch (2135-mm) diameter at floor level for units mounted 96 inches (2440 mm) above floor; 18-foot (5.5-m) diameter at floor level for units mounted 25 feet (7.6 m) above floor.

C. Device Performance:

1. Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1 deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across two adjacent segments of detector's field of view.
2. Test Indicator: LED test indicator that is not visible during normal operation. When visible, indicator shall light when sensor detects an intruder. Locate test enabling switch under sensor housing cover.

2.6 MASTER CONTROL UNIT

- A. Description: Supervise sensors and detection subsystems and their connecting communication links, status control (secure or access) of sensors and detector subsystems, activation of alarms and supervisory and trouble signals, and other indicated functions.
1. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 2. Include a real-time clock for time annotation of events on the event recorder and printer.
 3. Addressable initiation devices that communicate device identity and status.
 4. Control circuits for operation of mechanical equipment in response to an alarm.
- B. Power Supply Circuits: Master control units shall provide power for remote power-consuming detection devices. Circuit capacity shall be adequate for at least a 20 percent increase in load.
- C. Cabinet: Lockable, steel enclosure arranged so operations required for testing, normal operation, and maintenance are performed from front of enclosure. If more than a single cabinet is required to form a complete control unit, provide exactly matching modular enclosures. Accommodate all components and allow ample gutter space for field wiring. Identify each enclosure by an engraved, laminated, phenolic-resin nameplate. Lettering on enclosure nameplate shall not be less than 1 inch (25 mm) high. Identify, with permanent labels, individual components and modules within cabinets.
- D. Transmission to Monitoring Station: A communications device to automatically transmit alarm, supervisory, and trouble signals to the monitoring station, operating over a standard voice grade telephone leased line. Comply with UL 1635. Contractor shall provide cat 6 telephone cable to telephone demark.

2.7 SECURITY FASTENERS

- A. Operable only by tools produced for use on specific type of fastener by fastener manufacturer or other licensed fabricator. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.

PART 3 - EXECUTION

3.1 SYSTEM INSTALLATION

- A. Comply with UL 681 and NFPA 731.
- B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- C. Connecting to Existing Equipment: Verify that existing perimeter security system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the Supervising Station.
 - 3. Expand, modify, and supplement existing control equipment as necessary to extend existing control functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceways.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Wires and Cables:
 - 1. Conductors: Size as recommended in writing by system manufacturer 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.
- E. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

3.3 GROUNDING

- A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.
- B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

- C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

3.4 FIELD QUALITY CONTROL

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. 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.
- C. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
 - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 - 2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."
- D. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."
- E. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the intrusion detection system.

END OF SECTION 16723

SECTION 16750 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a video surveillance system consisting of cameras, network video recorder, and data transmission wiring. The video surveillance system shall be an IP type system with cameras connected to the data network. The video surveillance system shall be considered an extension of the existing WWII campus video surveillance system and all cameras shall be viewed at the main security control room on campus via the network. The new video surveillance system shall be compatible with the existing Genetec system. All hardware, software and licensing, and programming shall be provided for a complete and fully functional system.
 - 1. The existing campus security system vendor is,
RAE Security
21399 Marion Lane, Suite E
Mandeville, LA 70471
(713) 589-2594

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For video surveillance. Include plans locating all devices and equipment, 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. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
 - 3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.
- D. Calculations: Submit calculation to show total power budget and NVR storage is capable of 30 days of recording.
- E. Field quality-control reports.
- F. 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. Comply with NECA 1.
- C. Comply with NFPA 70.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Surge Protection: Protect components from voltage surges entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
- B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 CAMERAS

- A. Manufacturers: Subject to compliance with requirements,
 - 1. Axis
 - 2. Genetec
- B. Indoor Camera (Axis P3265-LV):
 - 1. High definition 2 MP dome camera with IR and deep learning. Features include
 - a. 1/2.8" progressive scan RGB CMOS image sensor.
 - b. Automatically removable infrared-cut filter
 - c. 1/66500 s to 2 s shutter speed
 - d. Varifocal, 3.4-8.9mm, F1.8 lens
 - 1) Horizontal field of view: 100 to 36 degrees
 - 2) Vertical field of view: 53 to 20 degrees
 - 3) Minimum focus distance: 20 inches

- 4) IR corrected
- e. ARTPEC-8 system on chip. 1024 MB RAM, 8192 MB Flash, deep learning processing unit
- f. H.264 video compression
- g. 1920x1080 resolution
- h. 25/30 fps
- i. Two way, full duplex audio streaming
- j. IP52 and IK-10 rated, polycarbonate hard coated dome

C. Outdoor Camera (Axis P3265-LVE):

- 1. High definition 2 MP dome camera with IR and deep learning. Features include
 - a. 1/2.8” progressive scan RGB CMOS image sensor.
 - b. Automatically removable infrared-cut filter
 - c. 1/66500 s to 2 s shutter speed
 - d. Varifocal, 3.4-8.9mm, F1.8 lens
 - 1) Horizontal field of view: 100 to 36 degrees
 - 2) Vertical field of view: 53 to 20 degrees
 - 3) Minimum focus distance: 20 inches
 - 4) IR corrected
 - e. ARTPEC-8 system on chip. 1024 MB RAM, 8192 MB Flash, deep learning processing unit
 - f. H.264 video compression
 - g. 1920x1080 resolution
 - h. 25/30 fps
 - i. Two way, full duplex audio streaming
 - j. IP66, NEMA 4X and IK-10 rated, polycarbonate hard coated dome

D. 360 degree Indoor Camera (Axis P3735-PLC Panoramic Camera):

- 1. High definition 4x2 MP multidirectional dome camera with IR and deep learning. Features include
 - a. 4 x 1/2.8” progressive scan RGB CMOS image sensor.
 - b. Automatically removable infrared-cut filter
 - c. 1/28000 s to 1.5 s shutter speed
 - d. Varifocal, 3.2-8.1mm, F1.9-3.2 lens
 - 1) Horizontal field of view: 108 to 40 degrees
 - 2) Vertical field of view: 55 to 23 degrees
 - 3) Minimum focus distance: 1.6 ft
 - 4) IR corrected
 - e. ARTPEC-8 system on chip. 2048 MB RAM, 8192 MB Flash, deep learning processing unit
 - f. H.264 video compression
 - g. 4 x 1920x1080 resolution
 - h. 25/30 fps
 - i. Two way, full duplex audio streaming
 - j. IP66 and IK-10 rated, polycarbonate hard coated dome

2.3 VIDEO STORAGE

- A. Description: Rack mount video surveillance grade NLSAS storage with RAID configuration. Local and remote server management. Intel Xeon processor, 32 GB DDR5. Enterprise HDD (hot-swappable) drives (4 total). 64 TB raw capacity, 47 TB usable capacity. Genetec Streamvault SV-2040E-R4-64T-16-436 archiver and directory with SV-CFG-GSC-5.13 security center.

2.4 POE SWITCH

- A. 48 port managed PoE switch for video surveillance with integrated DHCP server for automatic assignment of IP addresses and discovery of connected Axis devices. 740 watt power budget, compliant with IEEE 802.3bt up to 90W. 130.944 Mpps throughput, 176 Gbps switching capacity, 32 k MAC table, 10240 Bytes Jumbo frames. IEEE 802.1X and HTTPS encryption network security. Surge protection: 1 kV network ports, 2kV AC lines. Designed for 19" wide rack mount. Axis D8248.

2.5 CAMERA-SUPPORTING EQUIPMENT

- A. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- B. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- C. Surge Protection. Provide surge protection for all wiring to exterior cameras.

2.6 SIGNAL TRANSMISSION COMPONENTS

- A. Cable:
 - 1. Cat 6.

PART 3 - EXECUTION

3.1 WIRING

- A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Install cables in raceways unless otherwise indicated.
 - 1. Except raceways are not required in accessible indoor ceiling spaces and attics.
 - 2. Conceal raceways and wiring except in unfinished spaces.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

- D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. 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-486B.
- E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras with ~~84-inch-~~ (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
- B. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems."

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. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
 - 2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
 - a. Verify operation of auto-iris lenses.
 - b. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
 - c. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object **50 to 75 feet (17 to 23 m)** away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
 - d. Set and name all preset positions; consult Owner's personnel.
 - e. Set sensitivity of motion detection.
 - f. Connect and verify responses to alarms.
 - g. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.
- C. Video surveillance system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 16750

SECTION 16777 – ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes security access system.
 - 1. The security access system is an extension of the existing system in the theater building. The new system shall be fully compatible with the existing system, and shall be capable of performing as a stand-alone system should the communication link with the existing system fails.
 - 2. New security access system devices and equipment shall match the existing building standard.
 - a. The Access Control system shall utilize HID compatible card readers (HID Signo Reader 40) for compatibility with Owners existing Access Control systems.
 - b. The new system shall be compatible with Genetec software
 - 3. The existing campus security system vendor is,
RAE Security
21399 Marion Lane, Suite E
Mandeville, LA 70471
(713) 589-2594

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Comply with SIA BIO-01.
- B. Shop Drawings:
 - 1. System labeling schedules.
 - 2. Wiring diagrams.
- C. Field quality-control reports.
- D. Operation and maintenance data include the following:
 - 1. Software documentation.
 - 2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.
 - 3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
 - 4. System installation and setup guides with data forms to plan and record options and setup decisions.

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. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.
- C. Comply with NFPA 70, "National Electrical Code."

1.4 COORDINATION

- A. The contractor shall coordinate the access control system with the door hardware specification, and provide all hardware, software, cabling, raceways, and programming for a complete and fully functional access control system. The access control contractor shall attend a pre-installation meeting with the door hardware vendor, the architect and Owner personnel.

PART 2 - PRODUCTS

2.1 OPERATION

- A. General:
 - 1. Microprocessor based control panel, controllers and other hardware, connected by a high speed electronic data transmission network.
 - 2. System shall have capacity for 25% future growth.
 - 3. Security access system shall use a single database for access-control and credential-creation functions.
- B. Distributed Processing: A fully distributed processing system.
 - 1. Access-control information, including time, date, valid codes, access levels, and similar data, shall be downloaded to controllers so each controller can make access-control decisions.
 - 2. Intermediate controllers for access control are prohibited.
 - 3. In the event that communications with the central controller are lost, controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the central station.
- C. System Network Requirements:
 - 1. System components shall be interconnected and shall provide automatic communication of status changes, commands, field-initiated interrupts, and other communications required for proper system operation.
 - 2. Communication shall not require operator initiation or response and shall return to normal after partial- or total-network interruption such as power loss or transient upset.
 - 3. System shall automatically annunciate communication failures to the operator and shall identify the communications link that has experienced a partial or total failure.

4. Communications controller may be used as an interface between the central-station display systems and the field device network. Communications controller shall provide functions required to attain the specified network communications performance.
- D. Central station shall provide operator interface, interaction, display, control, and dynamic and real-time monitoring. Central station shall control system networks to interconnect all system components, including workstations and field-installed controllers.
- E. Field equipment shall include controllers, sensors, and controls.
 1. Controllers shall serve as an interface between the central station and sensors and controls.
 2. Data exchange between the central station and the controllers shall include down-line transmission of commands, software, and databases to controllers.
 3. The up-line data exchange from the controller to the central station shall include status data such as intrusion alarms, status reports, and entry-control records.
 4. Controllers are classified as alarm-annunciation or entry-control type.
- F. System Response to Alarms: Field device network shall provide a system end-to-end response time of one second(s) or less for every device connected to the system.
- G. False-Alarm Reduction: The design of the central station and controllers shall contain features to reduce false alarms. Equipment and software shall comply with SIA CP-01.
- H. Error Detection:
 1. Use a cyclic code method to detect single- and double-bit errors, burst errors of eight bits or fewer, and at least 99 percent of all other multibit and burst errors between controllers and the central station.
 2. Interactive or product error-detection codes alone will not be acceptable.
- I. Data Line Supervision: System shall initiate an alarm in response to opening, closing, shorting, or grounding of data transmission lines.
- J. Door Hardware Interface:
 1. Comply with requirements in Division 8 Sections for door hardware required to be monitored or controlled by the security access system.
 2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.2 APPLICATION SOFTWARE

- A. Controller Software:
 1. Controllers shall operate as autonomous, intelligent processing units.
 - a. Controllers shall make decisions about access control, alarm monitoring, linking functions, and door-locking schedules for their operation, independent of other system components.

- b. Controllers shall be part of a fully distributed processing-control network.
 - c. The portion of the database associated with a controller, and consisting of parameters, constraints, and the latest value or status of points connected to that controller, shall be maintained in the controller.
- 2. The following functions shall be fully implemented and operational within each controller:
 - a. Monitoring inputs.
 - b. Controlling outputs.
 - c. Automatically reporting alarms to the central station.
 - d. Reporting of sensor and output status to central station on request.
 - e. Maintaining real time, automatically updated by the central station at least once a day.
 - f. Communicating with the central station.
 - g. Executing controller resident programs.
 - h. Diagnosing.
 - i. Downloading and uploading data to and from the central station.
- 3. Controller Operations at a Location:
 - a. Up to 64 controllers connected to TIA 485-A communications loop. Globally operating I/O linking and anti-passback functions between controllers within the same Location without central-station or workstation intervention. Linking and anti-passback shall remain fully functional within the same Location even when the central station or workstations are off-line.
 - b. In the event of communication failure between the central station and a Location, there shall be no degradation in operations at the controllers at that Location. Controllers at each Location shall be connected to a memory buffer with a capacity to store up to 10,000 events; there shall be no loss of transactions in system history files until the buffer overflows.
 - c. Buffered events shall be handled in a first-in-first-out mode of operation.
- 4. Individual Controller Operation:
 - a. Controllers shall transmit alarms, status changes, and other data to the central station when communications circuits are operable. If communications are not available, controllers shall function in a stand-alone mode; operational data, including the status and alarm data normally transmitted to the central station, shall be stored for later transmission to the central station. Storage capacity for the latest 1024 events shall be provided at each controller.
 - b. Card-reader ports of a controller shall be custom configurable for at least 120 different card-reader or keypad formats. Multiple reader or keypad formats may be used simultaneously at different controllers or within the same controller.
 - c. Controllers shall provide a response to card readers or keypad entries in less than 0.25 seconds, regardless of system size.
 - d. Controllers that are reset, or powered up from a nonpowered state, shall automatically request a parameter download and reboot to their proper working state. This shall happen without any operator intervention.

- e. Initial Startup: When controllers are brought on-line, database parameters shall be automatically downloaded to them. After initial download is completed, only database changes shall be downloaded to each controller.
 - f. On failure for any reason, controllers shall perform an orderly shutdown and force controller outputs to a predetermined failure-mode state, consistent with the failure modes shown and the associated control device.
 - g. After power is restored, following a power failure, startup software shall initiate self-test diagnostic routines, after which controllers shall resume normal operation.
 - h. After controller failure, if the database and application software are no longer resident, controllers shall not restart but shall remain in the failure mode until repaired. If database and application programs are resident, controllers shall immediately resume operation. If not, software shall be restored automatically from the central station.
5. Communications Monitoring:
- a. System shall monitor and report status of TIA 485-A communications loop of each Location.
 - b. Communication status window shall display which controllers are currently communicating, a total count of missed polls since midnight, and which controller last missed a poll.
 - c. Communication status window shall show the type of CPU, the type of I/O board, and the amount of RAM memory for each controller.
6. Operating systems shall include a real-time clock function that maintains seconds, minutes, hours, day, date, and month. The real-time clock shall be automatically synchronized with the central station at least once a day to plus or minus 10 seconds. The time synchronization shall be automatic, without operator action and without requiring system shutdown.
- B. Alarm Monitoring: Monitor sensors, controllers, and DTS circuits and notify operators of an alarm condition. Display higher-priority alarms first and, within alarm priorities, display the oldest unacknowledged alarm first. Operator acknowledgment of one alarm shall not be considered acknowledgment of other alarms nor shall it inhibit reporting of subsequent alarms.
- 1. Displayed alarm data shall include type of alarm, location of alarm, and secondary alarm messages.
 - 2. Printed alarm data shall include type of alarm, location of alarm, date and time (to nearest second) of occurrence, and operator responses.
 - 3. Maps shall automatically display the alarm condition for each input assigned to that map if that option is selected for that input location.
 - 4. Alarms initiate a status of "pending" and require the following two handling steps by operators:
 - a. First Operator Step: "Acknowledged." This action shall silence sounds associated with the alarm. The alarm remains in the system "Acknowledged" but "Un-Resolved."
 - b. Second Operator Step: Operators enter the resolution or operator comment, giving the disposition of the alarm event. The alarm shall then clear.

5. Each alarm point shall be programmable to disallow the resolution of alarms until the alarm point has returned to its normal state.
6. Alarms shall transmit to central station in real time.
7. Alarms shall be displayed and managed from a minimum of four different windows.
 - a. Input Status Window: Overlay status icon with a large red blinking icon. Selecting the icon will acknowledge the alarm.
 - b. History Log Transaction Window: Display name, time, and date in red text. Selecting red text will acknowledge the alarm.
 - c. Alarm Log Transaction Window: Display name, time, and date in red. Selecting red text will acknowledge the alarm.
 - d. Graphic Map Display: Display a steady colored icon representing each alarm input location. Change icon to flashing red when the alarm occurs. Change icon from flashing red to steady red when the alarm is acknowledged.
8. Once an alarm is acknowledged, the operator shall be prompted to enter comments about the nature of the alarm and actions taken. Operator's comments may be manually entered or selected from a programmed predefined list, or a combination of both.
9. For locations where there are regular alarm occurrences, provide programmed comments. Selecting that comment shall clear the alarm.
10. The time and name of the operator who acknowledged and resolved the alarm shall be recorded in the database.
11. Identical alarms from the same alarm point shall be acknowledged at the same time the operator acknowledges the first alarm. Identical alarms shall be resolved when the first alarm is resolved.
12. Alarm functions shall have priority over downloading, retrieving, and updating database from workstations and controllers.
13. When a reader-controlled output (relay) is opened, the corresponding alarm point shall be automatically bypassed.

2.3 SURGE AND TAMPER PROTECTION

- A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.
 1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."
 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.
- B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.4 CONTROLLERS

- A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the central station or workstation for controlling its operation.
- B. Subject to compliance with requirements in this article, manufacturers may use multipurpose controllers.
- C. Battery Backup: Sealed, lead acid; sized to provide run time during a power outage of 90 minutes, complying with UL 924.
- D. Alarm Annunciation Controller:
 - 1. The controller shall automatically restore communication within 10 seconds after an interruption with the field device network.
 - a. Inputs: Monitor dry contacts for changes of state that reflect alarm conditions. Provides at least eight alarm inputs, which are suitable for wiring as normally open or normally closed contacts for alarm conditions.
 - b. Alarm-Line Supervision:
 - 1) Supervise the alarm lines by monitoring each circuit for changes or disturbances in the signal using dc change measurements. System shall initiate an alarm in response to an abnormal current, which is a dc change of 5 percent or more for longer than 500 ms.
 - 2) Transmit alarm-line-supervision alarm to the central station during the next interrogation cycle after the abnormal current condition.
 - c. Outputs: Managed by central-station software.
 - 2. Auxiliary Equipment Power: A GFI service outlet inside the controller enclosure.
- E. Entry-Control Controller:
 - 1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.
 - a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.
 - b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:
 - 1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.

- 2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.
 - c. Maintain a date-, time-, and Location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.
2. Inputs:
 - a. Data from entry-control devices; use this input to change modes between access and secure.
 - b. Database downloads and updates from the central station that include enrollment and privilege information.
3. Outputs:
 - a. Indicate success or failure of attempts to use entry-control devices and make comparisons of presented information with stored identification information.
 - b. Grant or deny entry by sending control signals to portal-control devices.
 - c. Maintain a date-, time-, and Location-stamped record of each transaction and transmit transaction records to the central station.
 - d. Door Prop Alarm: If a portal is held open for longer than 20 seconds, alarm sounds.
4. With power supplies sufficient to power at voltage and frequency required for field devices and portal-control devices.
5. Data Line Problems: For periods of loss of communication with the central station, or when data transmission is degraded and generating continuous checksum errors, the controller shall continue to control entry by accepting identifying information, making authentication decisions, checking privileges, and controlling portal-control devices.
 - a. Store up to 1000 transactions during periods of communication loss between the controller and access-control devices for subsequent upload to the central station on restoration of communication.
6. Controller Power: NFPA 70, Class II power-supply transformer, with 12- or 24-V ac secondary, backup battery and charger.
 - a. Backup Battery: Premium, valve-regulated, recombinant-sealed, lead-calcium battery; spill proof; with a full one-year warranty and a pro rata [19] [9]-year warranty. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
 - b. Backup Battery: Valve-regulated, recombinant-sealed, lead-acid battery; spill proof. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
 - c. Backup Power-Supply Capacity: 24 hours of battery supply. Submit battery and charger calculations.

- d. Power Monitoring: Provide manual, dynamic battery-load test, initiated and monitored at the control center; with automatic disconnection of the controller when battery voltage drops below controller limits. Report by using local controller-mounted digital displays and by communicating status to central station. Indicate normal power on and battery charger on trickle charge. Indicate and report the following:
 - 1) Trouble Alarm: Normal power-off load assumed by battery.
 - 2) Trouble Alarm: Low battery.
 - 3) Alarm: Power off.

2.5 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

- A. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.
- B. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
- C. Enclosure: Suitable for surface, semi-flush, pedestal, mullion, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:
 1. Indoors, controlled environment.
 2. Indoors, uncontrolled environment.
 3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.
- D. Proximity Readers:
 1. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction, and shall receive and decode a unique identification code number transmitted from the credential card.
 2. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique identification code number.
 3. The card reader shall read proximity cards in a range from contact to at least 6 inches (150 mm) from the reader.
 4. Communication Protocol: HID.

2.6 DOOR HARDWARE INTERFACE

- A. Exit Device with Alarm: Operation of the exit device shall generate an alarm. Exit device and alarm contacts are specified in Division 8 Section "Door Hardware."
- B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Division 8 Section "Door Hardware."

- C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Division 8 Section "Door Hardware."
- D. Electromagnetic Locks: End-of-line resistors shall provide power-line supervision. Lock status sensing signal shall positively indicate door is secure. Power and signal shall be from the controller. Electromagnetic locks are specified in Division 8 Section "Door Hardware." Provide request to exit pushbutton and motion detector as well as fire alarm interface (unlock door upon fire alarm condition) for doors with electromagnetic locks.

2.7 CABLES

- A. General Cable Requirements: Provide cables as recommended by system manufacturer. LAN cables shall be cat 6.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with recommendations in SIA CP-01.
- B. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
 - 1. Record setup data for control station and workstations.
 - 2. For each Location, record setup of controller features and access requirements.
 - 3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
 - 4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
 - 5. Assign action message names and compose messages.
 - 6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
 - 7. Prepare and install alarm graphic maps.
 - 8. Develop user-defined fields.
 - 9. Develop screen layout formats.
 - 10. Propose setups for guard tours and key control.
 - 11. Discuss badge layout options; design badges.
 - 12. Complete system diagnostics and operation verification.
 - 13. Prepare a specific plan for system testing, startup, and demonstration.
 - 14. Develop acceptance test concept and, on approval, develop specifics of the test.
- C. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.2 CABLING

- A. Wiring Method: Install wiring in raceway except within consoles, cabinets, desks, and above accessible ceilings. Conceal raceway and wiring except in unfinished spaces.
- B. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.
- C. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.3 GROUNDING

- A. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Bond shields and drain conductors to ground at only one point in each circuit.
- C. Signal Ground:
 - 1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
 - 2. Bus: Mount on wall of main equipment room with standoff insulators.
 - 3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.4 SYSTEM SOFTWARE AND HARDWARE

- A. Develop, install, and test software and hardware, and perform databases tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.5 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. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-B.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-B.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
 3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
- C. Devices and circuits will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Contractor shall provide an installation tag (white tag) on the control panel(s) per state fire marshal requirements. Tag to include registration number, tech name, license number and signature, code & year, plan review number, serial/model number and installation date.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to supervise and assist with startup service.
1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
 2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain security access system.

END OF SECTION 16777