

PROJECT MANUAL AND
SPECIFICATIONS

Green Cross Plasmapheresis Center

419 E. University Drive
Edinburg, TX 78539

Prepared for:
GCAM, Inc.
1561 Orangethorpe Ave.
Suite 205
Fullerton, CA 92831



Casler Design Group
10805 Indeco Drive
Cincinnati, Ohio 45241

Project Number 2674.0010

March 7, 2019

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INVITATION TO BID

PART 1 - GENERAL

1.1 PROJECT INFORMATION

- A. Notice is hereby given that GCAM, Inc. (the Owner), 1561 E. Orangethorpe Avenue, Suite 205, Fullerton, CA 92831, will accept sealed Contractor bids for Green Cross Plasmapheresis Center, located at 419 E. University Drive Edinburg, TX 78539. Extent of Work is indicated on Drawings and in Specifications as prepared by Casler Design Group, Inc. 10805 Indeco Dr., Cincinnati, OH 45241, dated March 7, 2019.

1.2 METHOD OF BIDDING

- A. Bids shall be executed on the Bid Form included in the Project Manual.
- B. Bid for the Contract will be a single lump sum for the Contractors' portion of the Work.
- C. Bids shall be based on furnishing all labor, materials, services, equipment, permits, inspections, and overhead and profit (including all Federal, State, and Local taxes), to complete the entire Work of each Bid Package.

1.3 BID DUE DATE

- A. Sealed Bids, submitted in duplicate, shall be received at the offices of 1561 E. Orangethorpe Avenue, Suite 205, Fullerton, CA 92831 until 3:00 PM Pacific Standard Time Zone, 5:00 PM Central Standard Time Zone on **5/7/2019**. Bids shall be opened privately, and at the Owner's discretion.
- B. All bidders shall be notified in writing as to the status of their Bid acceptance or rejection. Bidder shall not withdraw his/her Bid within thirty (30) days from Bid due date without the consent of the Owner.
- C. The Owner reserves the right to accept or reject any or all Bids, or any part of any Bid, and to waive any informality or irregularity in any Bid received. The Owner is not obligated to accept the lowest, or any, Bids.

1.4 BIDDING DOCUMENTS

- A. Bidders shall obtain at least one (1) complete set of Bidding Documents. Bidding Documents can be obtained from one of the following sources: RGV Reprographics 519 S. Broadway St. McAllen, Texas 78501 (956) 686-1525; or directly from the Owner.
- B. Bidders may, at their option, obtain additional sets of Bidding Documents from named printing sources or the Owner. Cost of purchase of additional sets of Bidding Documents shall be borne by the Bidder and is non-refundable.

1.5 PRE-BID SITE INSPECTION

- A. All Bidders are required to thoroughly acquaint themselves with the Project Site. The Project Site, which is located at 419 E. University Drive Edinburg, TX 78539, will be open and access made available for Bidders' inspection on the following date:

1. Wednesday May 1, 2019; 7:00 AM till 11:00 PM and 12:00 PM till 5:00 PM

1.6 CONTRACT AWARD

- A. The Owner intends to award a Contract for the Work as soon as possible after receipt of Bids (or) within 30 days of receipt of Qualified Bids.
- B. Prior to award of Contract by the Owner, Bidders being considered for each portion of the Work may be required to submit a completed Contractor's Qualification Statement (AIA Document A305 -1986 Edition).
- C. Contract for the Work will be the Owner's *Standard Subcontract Agreement*.

1.7 TIME OF COMPLETION/SCHEDULE

- A. Contractors for the Work shall commence Work when and as directed by the Owner. The Substantial Completion date shall be determined by the Owner prior to award of the Contract.
1. Refer to Construction Manager's Schedule, included in the Project Manual, for the intended Schedule of the Work.
- B. No time extension will be granted due to weather. Contractor shall make any and all provisions necessary for temporary heating, protection, and other facilities required for the timely completion of the Work.
- C. Liquidated damages, as outlined in the Contract will be assessed for each calendar day in which work is not complete beyond the construction time period established.

1.8 INSURANCE

- A. Contractor shall purchase and maintain insurance as outlined in the Contract.

END OF SECTION

BID PACKAGE SUMMARY

1. Extent of work for each bid package is indicated throughout the Contract Documents (Drawings, Specifications and Project Manual). Specific requirements indicated on Drawings conflicting with requirements in Specifications shall be brought to the attention of the Architect. In general, the most restrictive requirements will apply.
2. All bid packages include i.) General Conditions of the Contract for Construction, ii.) Standard form of Agreement Between Owner and Contractor, iii.) Bidding Requirements and iv.) Division 1 - General Requirements.
3. All bid packages include all labor, materials, equipment, permits, services, inspections, fees and overhead/profit (including all Federal, State and Local Taxes) necessary to complete the entire work of the bid package.
4. All bid packages shall include daily clean-up and trash removal (including a proportionate share of the Construction Manager's dumpster charges).
5. All work required for a complete installation of the Work shall be included in the bid whether or not such work is specifically listed within the description below.
6. Bidders installing Owner-furnished material must provide quantity take-offs (with field measurements as applicable).
7. Certain Specification Sections contain work referenced in more than one bid package (i.e. 061000 - Rough Carpentry). Each bidder is to include the required work of all Specification Sections necessary for a complete installation of all the bid packages.

BID PACKAGES:

Bid Package 1 - Demolition:

Reference all documents for extent of demolition. Includes removal of existing storefront, partitions, doors and windows, all interior gypsum board and other applied finishes to masonry and/or structural substrates, plumbing fixtures and associated piping, mechanical equipment, ductwork, light fixtures and electrical devices and conduit back to source. Refer to drawings for demolition work performed by other trades.

Bid Package 2 - Paving:

Not Applicable.

Bid Package 3 - Fences and Gates:

Not Applicable.

Bid Package 4 - Landscaping:

Not Applicable.

Bid Package 5 - Concrete Work:

Reference all documents for extent of concrete work; includes new exterior slabs and walks. Cutting and patching of concrete slabs for installation of underground plumbing shall be part of Bid Package No. 20. Cutting and patching of concrete slabs for installation of underground electric shall be part of Bid Package No. 22.

Bid Package 6 - Masonry Work:

Not applicable.

Bid Package 7 - Structural Steel:

Reference all documents for extent of structural steel. Includes all structural steel framing and all metal fabrications (including miscellaneous angles, and other steel shapes), roof access ladder and opening reinforcement.

Bid Package 8 - Architectural Woodwork:

Reference all documents for extent of architectural woodwork; includes custom cabinets and countertops. Coordinate installation of concealed blocking required for installation of the work of this Bid Package with work of Bid Package No. 13.

Bid Package 9 - Pre-Manufactured Canopy Systems:

Not Applicable.

Bid Package 10 - Roofing Work:

Reference all documents for extent of roofing work. Includes pipe boxes for refrigeration lines and flashing of roof penetrations and curbs by other trades.

Bid Package 11 - Furnish Doors, Frames and Hardware:

Reference all documents for extent of openings; includes furnishing all steel and aluminum door frames; steel doors; wood doors; access doors; interior borrowed lite units; and door hardware. Doors, Frames and Hardware installation is by Bid Package No. 13.

Bid Package 12 - Entrances, Storefronts, Windows and Glazing:

Reference all documents for extent of entrances, storefronts, and windows; includes modifications to existing storefront, interior and exterior metal-framed storefronts, entrance doors, and glazing for all items. Provide glazing in doors and borrowed lite frames and windows provided by others.

Bid Package 13 – General Carpentry and Gypsum Board Construction:

Reference all documents for extent of gypsum board construction and related work. Includes interior framing, walls, partitions, bulkheads, drywall ceilings, sheathing, insulation, etc. as indicated on drawings. Provide blocking for wall-mounted and built-in elements including but not limited to, casework and cabinetry, toilet compartments, toilet room accessories, items identified on Drawing No. F1.01 and other miscellaneous items furnished or installed by others. Provide sanitary wall panels and trim, corner guards and wall protection. Install doors, frames and hardware furnished under Bid Package No. 11. Install Equipment furnished by Owner identified on Drawing No. F1.01.

Bid Package 14 - Ceramic Tile:

Reference all documents for extent of ceramic tile work for floors and walls; includes installation of cementitious backer units for wall tile installation and anti-fracture membrane at concrete slab control joints.

Bid Package 15 - Acoustical Ceilings:

Reference all documents for extent of acoustical ceilings; includes acoustical ceiling support system and panels.

Bid Package 16 – Resilient Flooring and Carpet:

Reference all documents for extent of resilient flooring and carpet; includes carpet, resilient sheet/tile flooring, rubber wall base and accessories.

Bid Package 17 - Painting and Wallcovering:

Reference all documents for extent of exterior painting, interior painting, and installation of wall coverings (including wall graphics); includes joint sealers.

Bid Package 18 - Toilet Compartments and Accessories:

Reference all documents for extent of toilet compartments and toilet room accessories. Coordinate installation of concealed blocking required for installation of the work of this Bid Package with work of Bid Package No. 13. Also includes fire extinguishers.

Bid Package 19 - Signage:

Reference all documents for extent of signage work; includes interior wall-mounted toilet room and room identification signage.

Bid Package 20 - Plumbing Systems:

Reference all documents for extent of plumbing systems; includes all material and labor to install complete and operating systems indicated. Provide connections to existing domestic water, natural gas, and sanitary sewer utility services, including cutting, trenching and patching required for installation of underground piping in building and under existing floor slab, building services piping, and plumbing fixtures and equipment. Perform periodic scheduled maintenance of plumbing fixtures and equipment during 12-month warranty period.

Bid Package 21 - HVAC Systems:

Reference all documents for extent of HVAC Systems; includes all material and labor to install fully-functioning HVAC systems with controls (including roof equipment curbs, package rooftop units, ductwork, air inlets and outlets, exhaust fans, etc.). Perform periodic scheduled maintenance of HVAC fixtures and equipment during 12-month warranty period. Provide general temporary heat as specified in Section 015000 - Temporary Facilities and Controls.

Bid Package 22 - Electrical Work:

Reference all documents for extent of electrical work; includes material and labor for all interior and exterior work indicated. Provide connections from existing utilities (including cutting, trenching and patching, required for installation of underground conduits below existing floor slab). Provide conduits and boxes with pull strings for installation of voice, data, and communications cabling and devices, (cabling and devices to be provided by Bid Package 23). Provide temporary electric power and light as specified in Section 015000 - Temporary Facilities and Controls.

Bid Package 23 – Voice, Data and Communications Work:

Reference all documents for extent of voice, data and communications work; includes low voltage wiring and devices, labeling of devices and cables, etc. Equipment and final connection work to be performed by tenant's contractor except as otherwise indicated in the documents.

Bid Package 24 - Freezer Installation: (NOT IN CONTRACT)

Reference all documents for extent of prefabricated walk-in freezer installation. Includes all material and labor to completely assemble and install walk-in freezers and associated refrigeration systems furnished by others (including receiving, storing, and protecting panels and equipment); furnishing and installing redwood cribbing, piping, supports, anchors, refrigerant, etc.), and to perform periodic scheduled maintenance during warranty period. The work includes furnishing, installing, and flashing all pipe penetrations through pipe box/roof curbs. Also includes all associated electrical controls work and coordination with other trades.

Bid Package 25 – Fire Protection Systems:

Reference all documents for extent of Fire protection work. All documents indicating extent of sprinkler modifications and fire alarm work are for reference only. System design, modifications and installation shall be performed by qualified professional. Provide all labor and material to install a completely operational Fire Protection (Sprinkler) System, include coordination with all other mechanical and electrical trades. In addition to complying with the insurance requirements in the Subcontract Agreement, the Subcontractor shall obtain Professional Liability Insurance covering negligent acts, errors, and omissions in the performance of professional services, including any design services required for the work, with policy limits of not less than Two Million Dollars (\$2,000,000) per claim and in the aggregate.

END OF SECTION

BID FORM

To (Owner): GCAM, Inc.
1561 E. Orangethorpe Avenue, Suite 205
Fullerton, CA 92831

Attention: Mr. Michael V. Paul

Note: Bids may be submitted to Owner via electronic mail (mpaul@gcamplasma.com) or facsimile (714.738.6468). However, a "hard copy" of original bid must be submitted to Owner.

Submitted By: _____

Company Name

Street Address

City/State/Zip Code

Telephone Number

Bid: _____

The undersigned hereby proposes to perform the Work as required by the Bidding Documents prepared by Casler Design Group, Inc. (issued March 7, 2019) for the following amount:

_____ Dollars(\$ _____).

Representations:

The undersigned certifies that he/she has thoroughly reviewed the Bidding and Contract Documents and that his/her Bid is representative of the full extent of Work indicated in the Bidding Documents. The undersigned further agrees that the Bidding and Contract Documents will represent the sole basis for the agreement(s) between the Owner and the Contractor.

The undersigned agrees that the Owner reserves the right to reject any and all Bids, and to waive irregularities in any Bid received.

The undersigned agrees that proposed Substitutions (if any) will be entertained only as indicated in the Project Manual. Improperly submitted Substitution requests will not be considered.

The undersigned agrees that his/her Bid shall be irrevocable for a period of not less than thirty (30) calendar days from the Bid due date.

If awarded this Subcontract, the undersigned agrees to execute and deliver to the Owner all required copies of the Contract Form and insurance verification within five (5) days of receipt of Contract forms.

If awarded this Contract, the undersigned agrees to commence Work on this Project and to achieve Substantial Completion of the Work, when and as mutually agreed upon with the Owner.

Addenda:

The undersigned acknowledges receipt of the following Addenda:

Addendum Number: _____ Date of Issue: _____

Addendum Number: _____ Date of Issue: _____

Addendum Number: _____ Date of Issue: _____

Execution:

The undersigned certifies that he/she is authorized to execute this document

Date

Signature of Agent

Title

Type of Business (Sole Proprietorship, Partnership, or Corporation)

State of Incorporation

Federal Tax I.D. Number



AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Green Cross Plasmapheresis Center

419 E. University Drive, Edinburg, TX 78539

THE OWNER:

(Name, legal status and address)

GCAM, Inc.

1561 Orangethorpe Ave., Suite 205

Fullerton, CA 92831

THE ARCHITECT:

(Name, legal status and address)

Casler Design Group, Inc.

10805 Indeco Drive

Cincinnati, OH 45241

This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its completion or modification.

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in

such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or

equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

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

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

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

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of

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other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor’s Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor’s Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner’s or Separate Contractor’s completed or partially completed construction is fit and proper to receive the Contractor’s Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner’s Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or

(3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

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

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

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

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in

Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

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

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

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

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

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

§ 15.4 Arbitration

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

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

for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

ADDENDUM**AIA STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR,
AND GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

This “Addendum”, effective _____, amends and supplements both the Construction Agreement and AIA Document A201-2017 General Conditions of the Contract for Construction Between Owner and Contractor (including all exhibits and other addenda attached thereto, collectively, the “Base Agreement”) of even date herewith by and between (i) GCAM, Inc., a California corporation (“Owner”), on the one hand, and (ii) _____ (“Contractor”), on the other hand, for the performance of tenant improvements at the Green Cross America Plasma Center located at _____ (the “Project”). All provisions of the Base Agreement which are not amended or supplemented herein remain in full force and effect. Where the terms of this Addendum are inconsistent with the Base Agreement, the Addendum shall be controlling, and where the terms of the Construction Agreement (as amended by Sections 1 through 7 of this Addendum) are inconsistent with AIA Document A201-2017 (as amended by Section 8 of this Addendum), the Construction Agreement (as amended) shall be controlling. Unless otherwise defined herein, defined terms in this Addendum have the same meaning as in the Base Agreement. As used in this Addendum, the term “Agreement” means the Base Agreement as modified and amended by Sections 1 through 7 of this Addendum.

1. Conflicts; Hierarchy. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes and ordinances, Contractor shall immediately notify Owner upon discovery thereof and shall follow Owner’s written instructions.

2. Contract Administration. Notwithstanding the use of the term “Architect” in this Agreement, Owner shall have the right upon written notice to Contractor to substitute itself or a designated third party into the role of the Architect for purposes of the construction administration authority and tasks related to the Work referenced in this Agreement. Contractor acknowledges that such substituted party may not be a licensed architect and that Owner is not holding itself or any such substituted party out as a licensed architect.

3. Owner as Tenant. Notwithstanding the use of the term “Owner” in this Agreement, Contractor acknowledges that Owner does not own the Project site. Instead, Owner leases the Project site from _____ (“Landlord”), pursuant to a lease between Owner (as lessee) and Landlord (as lessor) dated _____ (the “Lease”). Contractor has been provided with a redacted copy of the Lease and Contractor acknowledges that all of the provisions within the Lease that pertain to the design of alterations and improvements shall apply to Contractor and be deemed incorporated into this Agreement by this reference. Wherever Contractor is required under this Agreement to indemnify Owner or to name Owner as an additional insured, in that context the word “Owner” shall be deemed to include Landlord, Landlord’s property manager, Landlord’s mortgagee and other parties reasonably designated by Landlord, as permitted under the Lease.

4. Contractor’s Duties. In addition to all other duties and responsibilities of Contractor under the Agreement, Owner and Contractor agree as follows:

4.1 Contractor recognizes the relationship of trust and confidence established between Contractor and Owner by this Agreement, and covenants with Owner to furnish best skill and judgment. Contractor agrees to furnish conscientious business administration and supervision, to keep on the Work at all times an adequate supply of workers and materials, and to secure execution of the Work in the best

and soundest way and in the most expeditious and economical manner consistent with the interests of Owner.

4.2 Contractor shall furnish to Owner and Architect, as often as reasonably required by Owner (and at least monthly), full reports of the progress of the Work. Owner, Contractor and Architect, or any of them, shall hold meetings at the Project site at such times as the Owner reasonably requests.

4.3 Contractor shall arrange and attend all inspections of the Work required by any governmental agencies in a manner so as to cause no delay in the Work or sequencing thereof to the extent possible. Contractor shall give Owner and Architect timely notice of when and where tests and inspections are to be made so that they may be present for such procedures if desired.

4.4 Contractor shall ensure that all material suppliers and subcontractors and their respective agents and employees adhere to the Contract Documents and that they order materials on time, taking into account the current market and delivery conditions and that they provide materials on time. Contractor shall coordinate its Work with that of all others on the Project including deliveries, storage, installations and construction utilities. Contractor shall be responsible for the space requirements, locations and routing of its equipment. Contractor acknowledges that it is Contractor's responsibility to hire all personnel for the proper and diligent prosecution of the Work. Contractor shall coordinate the relations of the various Subcontractors and trades for the orderly progress of the Work and shall use its best efforts to maintain labor peace for the duration of the Project. In the event of a labor dispute within or among its own labor force and/or that of Contractor's Subcontractors, Contractor shall not be entitled to any increase in the Contract Sum. Contractor shall ensure that every trade or Subcontractor preparing to work in an area previously prepared or worked upon by another trade shall review and approve the previously installed work and the area prior to commencing. Contractor shall ensure that any allegedly unsatisfactory conditions are reported to the Architect and Owner and that no work is done in the affected area until the unsatisfactory conditions have been eliminated or corrected. Commencement of work by a trade or a subcontractor shall constitute approval and acceptance of the prior work and the area by the Contractor and the trade or Subcontractor.

4.5 Promptly following Owner's request, Contractor shall deliver to Owner accurate lists of all Subcontractors, Sub-subcontractors and material suppliers retained in connection with the Work as well as copies of all contracts with such persons.

5. Subcontractor Insurance. Notwithstanding anything to the contrary in the Base Agreement, Contractor shall cause all Subcontractors to secure and maintain, at no expense to Owner, the insurance coverages set forth in Sections 5.1 through 5.3 below, in full accordance with the terms and conditions of this Section 5:

5.1 Workers' Compensation and Employer's Liability. Throughout the course of the Work, Workers' Compensation insurance as required by statute and Employer's Liability coverage in the amount of at least \$1,000,000 each accident, \$1,000,000 each disease – policy limit, \$1,000,000 each disease/each employee.

5.2 Automobile Liability. Throughout the course of the Work, automobile liability insurance of not less than \$1,000,000 combined single limit bodily liability and property damage as to all owned, non-owned and hired vehicles.

5.3 Commercial General Liability. Throughout the course of the Work and for a period until all applicable statutes of limitation or repose expire, General Liability insurance providing coverage for all operations, products, and completed operations, with limits of no less than \$2,000,000 each

occurrence, \$5,000,000 general aggregate, including coverage for personal and advertising injury liability, broad form property damage coverage, premises operations coverage, owners and contractors protective coverage, independent contractors coverage, coverage for false arrest, libel and slander, personal injury coverage, and full blanket contractual liability coverage. All coverage shall be on an "occurrence" basis and such policies shall otherwise be reasonably acceptable to Owner. "Claims made" or "modified occurrence" policies are not acceptable. Such policies must also provide that such insurance shall be primary insurance as to all additional insureds with respect to any claims, loss or liability arising out of the operations of the named insured, and that any insurance maintained by the additional insureds shall be excess and non-contributing.

5.4 Additional Insured Provision. Owner and such parties reasonably designated by Owner shall be named as additional insureds on the liability insurance policies by causing endorsements to that effect to be issued to all such additional insureds. Subcontractors shall continue naming the additional insureds for the entire length of time that insurance is required to be maintained. Any form that limits coverage to Ongoing Operations or otherwise does not grant additional insured status under the Products/Completed Operations coverage is not acceptable. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the additional insureds.

5.5 Additional Requirements. All policies shall contain a provision that the policy shall not be suspended, voided, canceled or reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, to Owner. If any Subcontractor fails to secure or maintain any policy of insurance required hereby, Owner may withhold further payments until the required insurance has been secured. Further, Owner may, at its sole discretion and without any obligation to do so, after ten (10) days' notice to Contractor, secure such a policy of insurance in the name of and for the account of a Subcontractor, as applicable, and Contractor shall reimburse Owner for the actual cost thereof. If Owner elects to exercise this latter option, Contractor shall cooperate fully with Owner in effecting the coverage. All required insurance shall be maintained with insurance carriers with a current AM Best Company rating of A-, Class VII or better. Any deductibles or self-inured retentions over \$10,000 must be pre-approved by Owner in writing, and shall not be applicable to the "additional insured" coverage. Contractor shall cause its Subcontractors to deliver to Owner certificates of insurance evidencing the coverages required above and endorsements evidencing additional insured status promptly upon execution of the Agreement. Each certificate (or a policy endorsement) shall expressly provide that such policy shall not be canceled or materially altered, except after thirty (30) days' prior written notice to Owner (except in the case of cancellation for non-payment of premium in which case cancellation shall not take effect until at least ten (10) days' prior written notice has been given to Owner). All individual endorsements executed by the respective insurance carriers shall accompany the certificate.

5.6 Waivers of Subrogation. Contractor shall cause all Subcontractors to waive in writing, to the greatest extent permitted by law, all rights against Owner and the other Indemnitees for damages or loss to the extent covered by the insurance required above, or which should be covered by the insurance described above if the same is actually procured and maintained by the Subcontractors. Contractor shall cause the policies of its Subcontractors to be endorsed so that the respective insurers waive all subrogation rights against Owner and the Indemnitees.

6. Books and Records. Throughout performance of the Work and for a period of four (4) years following Substantial Completion, Contractor shall preserve all documents relating to the Project, including but not limited to all estimating and other documents underlying its baseline schedule of values and its costs, documents relating to the performance of the Work, and all accounting documents. Upon five (5) business days' written notice, Owner shall be afforded access to all such documents, as maintained by Contractor in the ordinary course of business, for inspection, audit and copying, regardless

of whether claims or legal proceedings are then pending, and in addition to, and not in derogation of, any discovery rights Owner may have in any such legal proceedings.

7. Miscellaneous. All indemnity and defense obligations in the Agreement shall survive the expiration or termination of the Agreement. The terms and provisions of the Agreement are severable and if any part or provision of the Agreement is deemed invalid or unenforceable, it shall not impair or affect the validity, enforceability or effect of the remainder of the Agreement. If an action is commenced to enforce any provision of the Agreement, the prevailing party shall be entitled to recover from the losing party its reasonable attorney's fees and costs and expenses of suit. The Base Agreement and this Addendum may be executed in any number of counterparts and each counterpart shall be deemed to be an original document. All executed counterparts together shall constitute one and the same document, and any counterpart signature pages may be detached and assembled to form a single original document. In the event of a dispute between the parties hereto over the meaning of this Addendum, both parties shall be deemed to have been the drafter hereof, and any applicable law that states that contracts are construed against the drafter shall not apply.

8. Modifications to AIA 201-2017 General Conditions. All Section and Article references in this Section 8 are references to Sections and Articles in the AIA 201-2017 General Conditions of the Contract for Construction referenced in the first paragraph of this Addendum.

8.1 The following sentence is added after the last sentence of Section 1.1.3: "The Work also includes such incidental work items, which may not be expressly indicated in the Contract Documents, but which are considered Contractor's obligation to provide under normal standard construction industry customs and practices within the County in which the Project is located for similar projects or which are reasonably inferable from the Contract Documents."

8.2 The following sentence is added after the last sentence of Section 1.2.2: "Contractor represents that the Subcontractors, manufacturers and suppliers engaged or to be engaged by Contractor are and will be familiar with the requirements of the Contract Documents for performance by them of their obligations."

8.3 The following is added at the end of Section 1.2.1.1:

"In the event of conflicts or discrepancy among Contract Documents, interpretations will be based on the following priorities: (i) Modifications, including bulletins, Construction Change Directives, and Architect's supplemental instructions, (ii) the Construction Agreement, (iii) Addenda, with those of later date having precedence over those of an earlier date, (iv) the Supplementary Conditions, if any, (v) the General Conditions of the Contract for Construction, (vi) the Specifications, (vii) the Drawings, (viii) information included in larger scale details shall take precedence over smaller scale details, and (ix) other documents specifically enumerated in the Construction Agreement as part of the Contract Documents. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by Addendum, the better quality or greater quantity of Work shall be provided unless the Architect instructs otherwise in writing. If an item is shown on the Drawings but not specified, the Contractor shall provide the item of the same quality as similar items specified. If an item is specified but not shown on the Drawings, it shall also be provided and located by the Architect. The Drawings are indications of the design intent as well as specific instructions. The "details" included in Drawings show the intent of all similar areas. If questions arise about the construction of an area not specifically detailed, the Contractor shall consult with the Architect who will provide further details and instructions. Such further documentation, if consistent with the Contract Documents, shall not alter the Contract Sum.

8.4 Notwithstanding anything to the contrary in Section 1.5, Owner shall be entitled to reuse all Instruments of Service, including without limitation the Drawings and Specifications and any CAD files created in connection therewith, without the consent of or payment of any additional consideration to the Architect and Architect's consultants, whether such use is part of the Project or any future project which Owner may undertake.

8.5 The following sentence is added after the last sentence of Section 2.2.1:

"Notwithstanding the foregoing, if the Owner's direct and/or indirect owners are publicly-traded companies in good standing under the rules and regulations of the primary stock exchange where their securities are traded, then such owner(s)' publicly-available audited financial statements accompanied by an unqualified opinion of their certified public accountants shall constitute reasonable evidence that the Owner is able to fulfill the Owner's obligations under the Contract."

8.6 Section 2.3.4 is hereby deleted in its entirety.

8.7 The following phrase shall be added at the end of Section 2.3.5: " , subject to the Contractor's independent obligations to inspect the site as required in the Contract Documents."

8.8 In Section 2.5, the reference to "ten-day period" in the first sentence is hereby changed to "five-day period," and notwithstanding anything to the contrary in that section, prior approval of the Architect shall not be necessary for any action by the Owner and amounts charged to the Contractor.

8.9 The following is added after the last sentence in Section 3.1.1: "Owner and Contractor agree that _____ shall be Contractor's authorized representative on the Project for the duration of the Work and that Contractor shall not change such authorized representative without the prior written approval of Owner, which approval shall not be unreasonably withheld, conditioned or delayed. If such authorized representative is no longer capable of performing in his required capacity, Owner and Contractor shall agree on a mutually acceptable substitute representative."

8.10 The following sentence shall be added at the end of Section 3.1.3: "The Contractor and its Subcontractors, suppliers, design professionals (if any), and consultants shall perform the Work in strict accordance with the Contract Documents and in a workmanlike manner, consistent with the best skill and care provided by contractors and professionals providing services in the same or similar locality under similar circumstances."

8.11 The following section is added after Section 3.1.3:

"§ 3.1.4 Contractor represents to Owner that: (a) Contractor is financially solvent, able to pay its debts as they mature and possesses sufficient working capital (subject to payments by Owner required under this Agreement) to complete the Work required to be performed by it under this Agreement; (b) Contractor is able to furnish (directly or by subcontract or through vendors) any plant, tools, materials, supplies, equipment and labor necessary to complete the services required of Contractor under this Agreement and Contractor has sufficient experience and competence to perform the Work under the Agreement; and (c) Contractor is authorized to do business in the State in which the Project is located and properly licensed (to the extent required by law) by all necessary governmental authorities having jurisdiction over the Work.

8.12 The following is added after the last sentence of Section 3.2.1:

“Contractor represents and warrants to Owner that Contractor has carefully examined and satisfied itself as to all of the following matters prior to execution of the Contract: (i) the location, condition, layout and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs to complete the scope of Work within the Contract Time, (iv) accessibility to the Project site for vehicles, equipment, storage, and workmen and availability of parking for automobiles, trucks and motorized construction equipment; (v) character, quality, and quantity of surface and, to the extent reflected in the reports provided by Owner to Contractor (“Reports”), subsurface conditions to be encountered; (vi) any latent conditions affecting the Project site to the extent disclosed in the Reports or reasonably discoverable by Contractor; (vii) availability, quality, quantity and costs of materials, supplies, tools, equipment, labor and professional services necessary to complete the Work in the manner and within the cost and time frame required by the Contract Documents; (viii) construction traffic planning, barricades and site logistics, and (ix) governmental requirements applicable to the Work. Contractor recognizes the extra degree of care required under the site construction circumstances with respect to safety, protection of pedestrians, cleanliness of the site, health and other laws, and protection of existing utilities, adjacent tenant spaces, common areas and property. Contractor acknowledges that it has carefully reviewed all information provided to it by Owner, that it is thoroughly familiar with the Contract Documents, and that the Contract Documents are sufficient to have enabled Contractor to determine the cost of the Work and to construct the Work outlined therein in accordance with applicable laws, statutes, building codes, regulations, manufacturers’ recommendations and trade standards, and otherwise to fulfill all its obligations under the Agreement. Contractor further represents and warrants to Owner that it has compared any field measurements and results of its investigations with the Contract Documents. In arriving at the Contract Sum and the Contract Time, Contractor has, as an experienced and prudent contractor, exercised its best judgment and expertise to include the impact of all such conditions and circumstances described in this Section 3.2.1 upon the Contract Sum and Contract Time and notwithstanding anything to the contrary in the Contract, no additional charge or adjustment in the Contract Sum or Contract Time will be made therefor. Failure of Contractor to acquaint itself with all available Reports and other information concerning the above conditions will not relieve it from responsibility for estimating the cost or the difficulty of successfully performing the Work. The Reports have been made available to Contractor for Contractor’s information only and Owner assumes no responsibility for any conclusions which Contractor may draw. The Contractor shall be solely responsible for providing a safe place for the performance of the Work and comply with all laws, rules, regulations and orders related to safety on, near, and in transit to and from the site. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section 3.2.1. ”

8.13 The following is added after the last sentence of Section 3.2.4: “If Contractor discovers or becomes aware of any nonconformity, errors, inconsistencies or omissions in the Contract Documents as provided in Section 3.2.2 and Section 3.2.3 and Contractor commences the portion of the Work as to which such nonconformity, errors, inconsistencies or omissions relates prior to receiving instructions or clarifications from the Architect, any Work performed by Contractor shall be at its own risk and Contractor shall bear the costs of any necessary corrections to such Work.”

8.14 Section 3.3.1 is hereby amended and restated in its entirety to read as follows:

“§ 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. Where the Contract Documents refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used on the Work, such mention is intended only to indicate that the operations of Contractor shall be such as to produce the quality of work implied by the operations described, but that the actual determination of whether the described operations

may be safely or suitably employed on the Work shall be the responsibility of Contractor, who shall notify Architect in writing of any proposed alternative means, methods, techniques, sequences or procedures to be employed on the Work. The Architect shall evaluate any proposed alternative means, methods, techniques, sequences or procedures solely for conformance with the design intent for the completed construction. Unless Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences or procedures. All loss, damage or liability, or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents."

8.15 The following sections shall be added at the end of Section 3.4.3:

"§ 3.4.4 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 during the performance of the Work.

"§ 3.4.5 The 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 areas. 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."

8.16 Section 3.5.1 is hereby amended and restated in its entirety to read as follows:

"§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality, new and carrying full manufacturers', distributors' and installers' warranties unless otherwise required or permitted by the Contract Documents. The Contractor further warrants that the Work will be of workmanlike quality in strict conformance with the requirements of the Contract Documents, industry standards and manufacturers' recommendations 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, including substitutions not properly approved, shall be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by Contractor or a Contractor Party, improper or insufficient maintenance, improper operation, 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. All manufacturers', distributors' and installers' warranties and guarantees, express or implied, respecting any material or equipment used in or as part of the Work shall be deemed obtained by Contractor on behalf of Owner, and shall inure to Owner's benefit without the necessity of separate transfer or assignment thereof; provided, that Contractor shall execute a separate transfer or assignment thereof in form and substance acceptable to Owner upon Owner's request. Contractor, within thirty (30) days after Substantial Completion, shall collect, assemble and deliver to Owner, in a neat and orderly manual, the original and two (2) copies of all written warranties, equipment manuals, equipment and spare part list and similar manufacturer's information."

8.17 The reference to "14 days" in Section 3.7.4 shall be changed to "seven (7) days."

8.18 Each of the references to only "the Architect" in Section 3.9.2 shall be changed to "the Architect and the Owner."

8.19 The following section shall be added at the end of Section 3.9.3:

“§ 3.9.4 During the course of the Project, if in the Owner’s reasonable opinion any individuals working for the Contractor become unfit to continue on the Project or the Owner feels that it is in the best interest of the Project that an individual needs to be removed, the Owner may direct the Contractor to remove such individual from the Project and the Contractor shall promptly do so. If the Contractor replaces any key staff member of the Project team for any reason, the Owner must be provided with a detailed resume in advance and then an opportunity to meet with and approve the proposed replacement staff member prior to assignment to the Project. No such approval shall in any way relieve the Contractor of responsibility for the performance of its employees, contractors, and agents in connection with the Project.”

8.20 The first sentence of Section 3.10.1 shall be replaced with the following: “Unless the construction schedule for the Work has been agreed to by the parties on or prior to the execution of the Agreement, the Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner’s and Architect’s approval a Contractor’s construction schedule for the Work. The schedule shall be created, maintained, and updated using the best scheduling technology and skill available; shall be revised at appropriate intervals as the Owner or Architect may require; and shall account for work performed or materials supplied by the Owner’s separate contractor and suppliers.”

8.21 The following section shall be added after Section 3.10.3:

“§ 3.10.4 If Owner in good faith determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents or that Contractor has failed to comply with the schedule of construction, or Contractor otherwise fails, refuses or neglects to supply a sufficient amount of labor or material in the prosecution of the Work, then prior to Contractor’s submission of the next Application for Payment (but in no event less than five (5) days after Contractor’s receipt of notice from Owner), Contractor shall submit a remedial plan for Owner’s review and approval. If not incorporated into the remedial plan, in addition to all other remedies, Owner may require Contractor to take corrective measures necessary to expedite the progress of construction, including (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures (collectively, “Extraordinary Measures”). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. Owner’s right to require Extraordinary Measures is solely for the purpose of ensuring Contractor’s compliance with the stage of completion required by the schedule of construction and Contract Documents. Contractor shall not be entitled to an increase in the Contract Sum in connection with Extraordinary Measures required by Owner pursuant to this Section except to the extent such Extraordinary Measures were due to a delay which entitles Contractor to an extension of the Contract Time pursuant to Section 8.3.1 below and are approved in advance and in writing by Owner in which event such Extraordinary Measures shall be documented by a Change Order or Construction Change Directive.”

8.22 The following phrase is added at the end of the first sentence of Section 3.14.1: “as reasonably consistent with the requirements or information contained in the Contract Documents.”

8.23 The following section is added after Section 3.15.2:

“§ 3.15.3 Contractor shall be responsible for broken glass, and at and before completion of the Work, as directed by Owner, shall replace such damaged or broken glass. After broken glass has been replaced, Contractor shall remove all labels, wash, and polish both sides of all glass. Further, in addition to general broom cleaning, Contractor shall perform the final cleaning for all trades immediately upon completion of

the Work, which shall include, but not be limited to, the following: (a) remove temporary protections; (b) remove marks, stains, fingerprints and other soil or dirt from painted, decorated, and natural-finish woodwork and other Work; (c) remove spots, mortar, plaster, soil and paint from ceramic tile, marble, and other finish materials and wash or wipe clean; (d) clean fixtures, cabinet work and equipment, removing stains, paint, dirt, and dust and leave in undamaged, new condition; (e) clean aluminum in accordance with recommendations of the manufacturer; and (f) clean resilient floors thoroughly with a well-rinsed mop containing only enough moisture to clean off any surface dirt or dust and buff dry by machine to bring the surfaces to sheen.”

8.24 Section 3.18.1 is hereby amended and restated in its entirety to read as follows:

“§ 3.18.1 All Work performed by or on behalf of Contractor, including without limitation operations and activities of the Contractor Parties or anyone employed directly or indirectly by any of them at or for the Project, shall be at the exclusive risk of the Contractor. In addition to (and not in lieu of) any other indemnity obligations of Contractor under this Agreement and notwithstanding any other term or provision of the Contract Documents to the contrary, Contractor shall, to the fullest extent permitted by law, defend (at the Contractor’s sole cost and expense and with legal counsel approved by the Owner), protect, indemnify and hold harmless the Owner and its affiliates, Architect and their respective managers, members, principals, partners, officers, directors, shareholders, employees, consultants, representatives, agents, attorneys, successors and assigns (collectively, “Indemnitees”), from and against any and all claims, demands, obligations, liens, actions, causes of action, suits, settlements, judgments, awards, fines, penalties, costs, expenses, investigation costs, consultants’ fees, expert witness fees, attorneys’ fees, loss, liability and damages (collectively, “Damages”), of every kind and nature whatsoever, at any time arising out of or in any way connected with the Work or the negligence or willful misconduct of the Contractor Parties or anyone directly or indirectly employed by them or anyone for whose acts they may be liable. Contractor shall not, however, be required to indemnify any Indemnatee for any Damages to the extent such arise due to that Indemnatee’s negligence or willful misconduct. The provisions of this Section 3.18.1 shall survive the expiration or termination of this Contract.”

8.25 The following shall be added at the end of Section 3.18.2: “, and the Contractor hereby waives and agrees that it will not assert any defense of immunity under any applicable workers’ compensation laws with respect to the Contractor’s indemnity obligations to the Owner and all of its officers, employees, agents, and consultants hereunder for third party claims.”

8.26 The following section shall be added at the end of Section 3.18.2:

“§ 3.18.3 The Contractor shall post and maintain the Notice of Commencement in a prominent place on site during the entirety of the Construction Phase, if required by law, promptly notify the Owner of receiving any requests for copies of the notice of commencement, and promptly transfer copies of all notices of furnishing received.”

8.27 The following section shall be added at the end of Section 4.1.2:

“§ 4.1.3 Notwithstanding any other term or provision in the Contract Documents to the contrary, the Owner shall have the right, but not the obligation, to conduct any administrative activities of the Architect as stated in this document, including but not limited to all certifications and decisions on payment, Substantial Completion, and Final Completion. Any obligation by the Contractor to provide notice or information to the Architect shall also obligate the Contractor to provide such notice or information to the Owner as well. Nothing in this Section 4.1.3 shall alter the Architect’s obligations to the Owner as set forth in the separate Owner-Architect contract or otherwise impose the duties of a design professional upon the Owner.”

8.28 The following shall be inserted after the second sentence of Section 5.3: “Each subcontract agreement shall be prepared on a form of subcontract satisfactory to Owner. Each such subcontract agreement shall, where the context so requires, contain provisions that: (a) waive all Subcontractor’s rights against Owner for damages caused by fire or other perils covered by the insurance described in the Contract Documents; (b) require the Subcontractor to carry and maintain insurance coverage in accordance with the Contract Documents or such lower coverage as Owner may approve, and to file certificates of such coverage with Contractor; (c) require the Subcontractor (to the extent required by this Agreement) to submit certificates and waivers of liens for work completed by it and by its sub-subcontractors, and material suppliers as a condition to the disbursement of the progress payment next due and owing; (d) require that each Subcontractor continue to perform under its subcontract in the event this Agreement is terminated and Owner shall take an assignment of said subcontract and request such Subcontractor to continue such performance consistent with this Agreement; and (e) provide that Owner is an express intended third-party beneficiary of such subcontract.”

8.29 The following phrase shall be added at the end of Section 5.4.1: “until further assignment.”

8.30 The last sentence of Section 5.4.3 shall be deleted in its entirety.

8.31 Section 6.1.4 shall be deleted in its entirety.

8.32 The following section is added after Section 7.1.3:

“§ 7.1.4 No change in the Work shall be the basis of a change to the Contract Sum or the Contract Time unless authorized in writing by a written Change Order or Construction Change Directive. This requirement is of the essence and oral change orders or directives are not sufficient. Except for changes made on an emergency basis for the protection of persons or property from imminent harm, and not allowing time to execute a Change Order or Construction Change Directive, Contractor waives the right to recover any compensation for any changed Work performed in advance of, or without having received a written Change Order or Construction Change Directive issued in strict accordance with this Agreement. No course of conduct or dealings between the parties, nor express or implied acceptance of changes to the Work, nor any claim that Owner has been unjustly enriched by such change, whether or not there is in fact unjust enrichment, shall constitute a waiver or estoppel or shall be the basis for any change, modification, of amendment of the terms and conditions of this Agreement, except to the extent that the parties have entered into a written amendment of the Contract Documents, including a properly executed Change Order.”:

8.33 The following sections are added after Section 7.2.1.

“§ 7.2.2 Contractor may seek an adjustment of the Contract Sum or Contract Time by submitting a written proposed change order (“PCO”). As a condition precedent to an adjustment in the Contract Sum or Contract Time, Contractor shall, within 21 days after the occurrence of the event giving rise to Contractor’s claim for such an adjustment, or within 14 days after the Contractor first recognizes or reasonably should have recognized the condition giving rise to Contractor’s claim for such an adjustment, submit a PCO to the Owner and Architect with supporting analysis of the Drawings, Specifications, or conditions giving rise to the PCO, along with supporting cost data and schedule analysis. Contractor agrees that timely submission of a detailed PCO is a material term of the Contract Documents and furthermore agrees that a failure to submit a detailed and timely PCO in accordance with this Section 7.2 shall constitute a waiver by Contractor of all claims associated with the occurrence of the event giving rise to Contractor’s claim for an adjustment in the Contract Sum or Contract Time.

§ 7.2.3 The Owner or the Architect shall respond to each PCO in a timely manner. If neither the Owner nor the Architect respond to the PCO within 14 days, the PCO shall be deemed denied. The Owner or the Architect may nonetheless issue a Construction Change Directive under Section 7.3.1 for the work which is the subject of a PCO.”

8.34 Notwithstanding anything to the contrary in Section 7.3.4, the Owner (and not the Architect) shall determine the adjustment of the Contract Sum in the event the Contractor does not respond promptly or disagrees with the method of adjustment of the Contract Sum in connection with a Construction Change Directive.

8.35 The following sections shall be added at the end of Section 8.2.3:

“**§ 8.2.4** If the Project is delayed for any reason, the Owner may request a proposed recovery construction schedule from the Contractor, which shall include options for both timely achieving the original Substantial Completion and potential adjustments to the Substantial Completion date, as well as detailed estimates of the cost impacts, if any, on Contractor’s proposed options (“Proposed Recovery Schedule”). The Proposed Recovery Schedule shall include, at a minimum, proposed adjustments to one or more of the following: (1) workforce, (2) hours per shift, (3) shifts per workday, (4) workday per week, (5) equipment, and (6) activity logic.

§ 8.2.5 The Contractor shall submit the Proposed Recovery Schedule to the Owner within three (3) days of the Owner’s request and the Owner and the Architect will review and comment upon the Proposed Recovery Schedule within five (5) days. The Contractor will accept and incorporate all reasonable comments and resubmit, within three (3) days of receiving such comments, a revised Proposed Recovery Schedule. If approved by the Owner, within two (2) days of the Owner’s written notice, the Contractor will implement the approved Proposed Recovery Schedule. Unless otherwise approved by the Owner in writing, the Contractor shall be responsible for all direct and indirect costs necessary to implement the approved Proposed Recovery Schedule, except to the extent such costs are caused by the Owner’s acts or omissions.”

8.36 Section 8.3 shall be deleted in its entirety and replaced with the following:

“§ 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; by changes ordered in the Work; by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify a compensable delay as a result of the acts or errors of the Owner (“Owner-Caused Delay”), then the Contract Time shall be extended by Change Order for such reasonable time as the Architect or the Owner may determine. The Contract Sum shall be adjusted for Owner-Caused Delay by a reasonable amount as the Architect or the Owner may determine, subject to the provisions of Section 8.3.3 and the Contractor’s right to submit a Claim for unresolved issues arising from Owner-Caused Delay.

§ 8.3.2 If the Contractor is delayed at any time in the commencement or progress of the Work by labor disputes not caused by the Contractor, fire, unusual delay in deliveries, non-typical weather events, unavoidable casualties, or other causes beyond the Contractor’s control and not the proximate result of the Owner’s act or failure to act (“Force Majeure Delay”), then the Contractor shall be entitled to a non-compensable extension of the Contract Time due to delays resulting from Force Majeure Delays.

§ 8.3.3 If the Contractor seeks an increase in the Contract Sum as a result of Owner-Caused Delay, the Contractor shall submit a proposed change order within 21 days after the occurrence of the event giving

rise to Contractor's claim for such an adjustment, or within 14 days after the Contractor first recognizes, or reasonably should have recognized, the condition giving rise to Contractor's claim for such an adjustment, setting forth a proposed adjustment to the Contract Time and Contract Sum. To the fullest extent of the law, the Contractor agrees that it shall not be entitled to compensation for extended overhead, indirect costs, or increased profit arising from an extension of the Contract Time unless Contractor strictly complies with the requirements of this Section 8.3.3.

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

§ 8.3.5 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents, subject to strict compliance with the notice provisions herein."

8.37 Notwithstanding anything to the contrary set forth in Article 9, Owner and Contractor hereby agree as follows:

.1 Contractor shall provide waivers and lien releases (conditional and unconditional, as applicable) in accordance with applicable state laws, on forms reasonably approved by Owner and its Landlord, from the Contractor and all those Subcontractors, Sub-subcontractors, material and/or equipment suppliers, and other persons directly or indirectly engaged by the Contractor in connection with the Work (collectively, the "Contractor Parties" and individually, "Contractor Party") as a condition precedent to the Owner's obligation to make any progress payments.

.2 In taking action on any Application for Payment, the Owner shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and any such actions shall not be deemed to represent that (i) the Owner has made on-site inspections, or (ii) the Owner has made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract.

.3 Excluding any mechanic's liens or stop notices which directly result from Owner's failure to timely pay undisputed amounts owed the Contractor, the Contractor expressly agrees to promptly discharge, at its sole expense, each and every mechanic's lien and stop notice claim which may be recorded or served by any Contractor Parties in connection with the Work hereunder or any portion thereof. The Owner shall be entitled to withhold from payment to the Contractor an amount equal to 125% of the aggregate amount of any mechanic's lien or stop notice claims until the time that such liens and/or stop notices are discharged and/or satisfied, and final payment shall not be due while any such liens and/or such stop notice claims remain outstanding.

8.38 Notwithstanding anything to the contrary in Section 9.3.1, an itemized Applications for Payment shall be submitted to both the Architect and Owner for approval, and the Owner (not the Architect) shall determine what data substantiating the Contractor's right to payment are required.

8.39 Section 9.5.1.3 is hereby amended and restated in its entirety to read as follows:

"§ 9.5.1.3 "failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment or failure to provide conditional and unconditional lien waiver and release forms from all Subcontractors and suppliers in a form required by the Owner or Owner's lender."

8.40 Section 9.5.4 is hereby amended and restated in its entirety to read as follows:

"§ 9.5.4 If the Architect or the Owner 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.”

8.41 Section 9.6.1 is hereby amended and restated in its entirety as follows:

“§ 9.6.1 After the Architect or the Owner has approved any Application for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.”

8.42 Section 9.6.3 is hereby amended and restated in its entirety as follows:

“§ 9.6.3 The Architect or the Owner 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 Owner on account of portions of the Work done by such Subcontractor.”

8.43 The following shall be added at the beginning of Section 9.6.4:

“Upon each submission to the Architect of an Application for Payment, the Contractor shall also submit (a) a conditional (partial) lien waiver affidavit certifying to the Owner that all labor provided and materials furnished and included in the subject Application for Payment will be paid in full upon receipt of such payment; and (b) an unconditional affidavit and waiver of lien certifying to the Owner that all labor provided and materials furnished and included in the immediately prior Application for Payment has been paid in full to each applicable Subcontractor and material supplier. All lien waiver forms shall be in a form approved by the Owner and the Architect and compliant with applicable law in the location of the Project.”

8.44 Section 9.7 is hereby amended and restated in its entirety as follows:

“§ 9.7 Failure of Payment

If the Architect or the Owner do not approve an Application for Payment, through no fault of the Contractor, within fourteen (14) days after receipt of the Contractor’s Application for Payment, or if the Owner does not pay the Contractor within seven (7) days after the date established in the Contract Documents the amount approved by the Architect or the Owner or awarded by binding dispute resolution, then the Contractor may, upon seven (7) 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.”

8.45 In Section 9.8.1, the term “fully” shall be inserted before the term “occupy.”

8.46 Notwithstanding anything to the contrary in Sections 9.8 and 9.9.1, the Contractor shall give any notice to both the Architect and the Owner, both the Architect and the Owner shall have the right to perform any inspection, and either the Architect or the Owner may make any necessary determination in connection with an inspection or a Certificate of Substantial Completion.”

8.47 Notwithstanding anything to the contrary in Section 9.10, both the Architect and Owner (rather than the Architect alone) shall make the final inspection, authorize the final Certificate for Payment, and make all necessary determinations, and all documents to be submitted by the Contractor in connection therewith shall be submitted to both the Architect and the Owner.

8.48 The following shall be added at the end of Section 9.10.2: “The Contractor agrees to indemnify, protect, defend, and hold the Owner harmless from and against all lien claims or indebtedness

incurred by the Owner as a result of Contractor's failure to pay Subcontractors and suppliers. The Owner shall have the right to pay any such claims or indebtedness out of any money due or to become due to Contractor. Notwithstanding the foregoing, the Owner agrees that it will not pay any such claim or indebtedness as long as same is being actively contested by Contractor and Contractor has taken all actions necessary (including the posting of a lien release bond, if required by the Owner, and filing a proper application for approval of the bond or collateral in the applicable court in the county/state in which the lien was filed) to protect the property interests of the Owner and any other party affected by such claim or indebtedness."

8.49 Notwithstanding anything to the contrary in Section 9.10.3, the Owner must also independently confirm that the delay in the final completion of the Work was not the Contractor's fault.

8.50 Section 9.10.4 is hereby amended and restated in its entirety to read as follows: "The making of final payment shall not constitute a waiver of any Claims by the Owner."

8.51 Section 10.3.3 is hereby amended and restated in its entirety to read as follows:

"§ **10.3.3** 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, attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) arising from the existence of hazardous materials at the Project in violation of applicable laws. Notwithstanding the foregoing, in no event shall Owner's indemnification obligations hereunder apply with respect to: (i) any hazardous materials previously disclosed to Contractor by Owner in written reports delivered by Owner to Contractor or otherwise, (ii) any hazardous materials encountered by Contractor where Contractor does not immediately stop Work in the affected area and notify the Owner and Architect of the condition as provided in Section 10.3.1, (iii) any hazardous materials introduced to the Project in any way by Contractor or its Subcontractors or materialmen or either of their agents, employees or contractors, or (iv) any such claims, damages, losses or expenses to the extent that they are due to the negligence or willful misconduct of the Contractor or its Subcontractors or materialmen or any of their agents, employees or contractors."

8.52 Section 10.3.4 is hereby amended and restated in its entirety to read as follows:

"§ **10.3.4** The Contractor shall not cause or permit any "Hazardous Materials" (as defined below) to be brought upon, kept or used in or about the job site except to the extent such Hazardous Materials: (i) are necessary for the prosecution of the Work; (ii) are required pursuant to the Contract Documents; and (iii) are customarily used in the construction industry where the Project is located in accordance with the best practices of such industry. Any Hazardous Materials allowed to be used on the job site shall be used, stored and disposed of in compliance with all applicable federal, state and local laws relating to such Hazardous Materials. Any unused or surplus Hazardous Materials allowed to be used on the job site shall be used, stored and disposed of in compliance with all applicable federal, state and local laws relating to such Hazardous Materials. Any unused or surplus Hazardous Materials, as well as any other Hazardous Materials which have been placed, released or discharged on the job site by Contractor or any of its Subcontractors, employees, agents, suppliers or subcontractors, shall be removed from the job site at the earlier of: (i) completion of the Work requiring the use of such Hazardous Materials; (ii) the completion of the Work as a whole; or (iii) within twenty-four (24) hours following Owner's demand for such removal. Such removal shall be undertaken by Contractor at its sole cost and expense, and shall be performed in accordance with all applicable laws. Any damage to the Work, the job site or any adjacent property resulting from the improper use, or any discharge or release, of Hazardous Materials shall be remedied by Contractor at its sole cost and expense, and in compliance with all applicable laws.

Contractor shall immediately notify Owner of any release or discharge of any Hazardous Materials on the job site. Contractor shall provide Owner with copies of all warning labels on products which Contractor or any of its Subcontractors or Sub-subcontractors will be using in connection with the Work, and Contractor shall be responsible for making any and all disclosures required under applicable “Community Right-to-Know” laws. Contractor shall not clean or service any tools, equipment, vehicles, materials or other items in such a manner as to cause of violation of laws or regulations relating to Hazardous Materials. All residue and waste materials resulting from any such cleaning or servicing shall be collected and removed from the job site in accordance with all applicable laws and regulations. Contractor shall immediately notify Owner of any citations, orders or warnings issued to or received by Contractor, or of which Contractor otherwise becomes aware, which relate to any Hazardous Materials on the job site. Without limiting any other indemnification provisions pursuant to law or specified in this Contract, Contractor shall indemnify, defend (at Contractor’s sole cost and with counsel satisfactory to Owner) and hold the Owner and Landlord harmless from and against any and all claims, demands, losses, damages, disbursements, liabilities, obligations, fines, penalties, costs and expenses in removing or remediating the effect of any Hazardous Materials on, under, from or about the job site, arising out of or relating to, directly or indirectly, Contractor’s failure to comply with any of the requirements of this Section 10.3.4. As used herein, the term “Hazardous Materials” means any hazardous or toxic substances, materials and wastes listed in the United States Department of Transportation Hazardous Materials Table (49 CFR 171.101) or listed by the Environmental Protection Agency as hazardous substances (40 CFR Part 302) and any amendments thereto, and any substances, materials or wastes that are or become regulated under federal, state or local law.”

8.53 Section 10.3.6 is hereby deleted in its entirety.

8.54 The following sentence shall be added at the end of Section 11.3.1: “Notwithstanding the foregoing, the Contractor shall be fully responsible for any deductibles under any policy to the extent the Contractor causes any property damage.”

8.55 The following is inserted at the end of the last sentence of Section 11.4: “to the extent such loss is covered by insurance maintained by Owner.”

8.56 The following is inserted at the end of the last sentence of Section 12.2.1: “and a sum equal to 100% of such costs shall be withheld and shall be payable only after such rejected Work has been satisfactorily corrected or completed.”

8.57 Section 12.2.2.1 is hereby amended and restated in its entirety to read as follows:

“§ **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, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly at Contractor’s sole expense 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. If the Contractor fails within seven (7) days after receipt of written notice from Owner to commence and continue with diligence and promptness to correct the nonconforming work. Owner may, without prejudice to its other remedies, correct the nonconforming work. and /or remove the nonconforming work and store salvageable materials or equipment at the Contractor’s expense. In such case, Contractor shall promptly reimburse Owner all costs and expenses incurred by Owner as a result the nonconforming work.”

8.58 The following is hereby inserted after the last sentence of Section 12.2.5: “Nothing contained in this Contract shall in any way limit the right of Owner to assert claims for damages resulting from patent or latent defects in the Work for the period of limitations prescribed by applicable law, and the foregoing shall be in addition to any other rights and remedies Owner may have hereunder or at law or in equity.”

8.59 The following section shall be added at the end of Section 12.2.5:

“§ **12.2.6** In the event of the Owner’s termination of the Contractor, under either Section 14.2 or Section 14.4, the Contractor shall be responsible for the costs of correcting Work rejected by the Architect or not complying with the Contract Documents, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect’s services and expenses made necessary thereby.”

8.60 Section 14.1.3 is hereby amended and restated in its entirety to read as follows:

“§ **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 15% overhead and profit on Work properly executed and actual costs for demobilizations not to exceed \$5,000 . The Contractor shall not be entitled to lost or anticipated profit on unperformed Work.”

8.61 The term “repeatedly” in Sections 14.2.1.1 and 14.2.1.3 shall be deleted.

8.62 The following shall be added at the end of the last sentence in Section 14.2.3: “and Owner shall have the right to pay any sums to any such persons or entities to whom Contractor shall be obligated and to charge such sums paid to the account of Contractor without recourse by Contractor to the extent Owner makes its payment in good faith after reasonable inquiry.”

8.63 The following sentence is added at the end of Section 14.4.3: “Under no circumstances shall the Contractor be entitled to anticipatory or unearned profits, consequential damages, or other damages of any sort as a result of a termination or partial termination under this Section 14.4.”

8.64 Section 15.1.1 is hereby amended by adding the following at the end thereof: “Notwithstanding anything to the contrary in this Agreement, Section 15.2 shall not apply to any Claim that is made after the date of final payment unless both Contractor and Owner consent to its application.”

8.65 Section 15.1.2 is hereby deleted in its entirety.

8.66 Section 15.1.3.1 is hereby amended and restated in its entirety to read as follows:

“§ **15.1.3.1** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered during the course of construction and prior to the date of final payment shall 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 Contractor under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after Contractor first recognizes the condition giving rise to the Claim, whichever is later.”

8.67 Section 15.1.3.2 is hereby amended and restated in its entirety to read as follows:

“§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after completion of construction and payment of the final payment shall be initiated by written notice to the other party. In such event, no decision by the Initial Decision Maker is required.”

8.68 Section 15.1.4.1 is hereby amended and restated in its entirety to read as follows:

“§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and Owner shall continue to make payments for undisputed amounts in accordance with the Contract Documents.”

8.69 The following shall be added at the end of Section 15.1.5: “All Claims seeking an adjustment in the Contract Sum shall include a detailed explanation of the contractual and technical basis for the Claim, along with cost data, including but not limited to invoices and job cost reports. Any claim for which notice has not been provided in strict accordance with the Contract Documents shall be deemed waived by Contractor.”

8.70 Section 15.1.6.1 is hereby amended and restated in its entirety to read as follows:

“§ 15.1.6.1 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, along with all necessary schedule data, native schedule files, and other information necessary to conduct a critical path analysis. In the case of a continuing delay, only one Claim is necessary.”

8.71 Section 15.1.7 is hereby amended and restated in its entirety to read as follows:

“§ 15.1.7 **Waiver of Claims for Consequential Damages.** The Contractor and Owner agree to the following limited mutual waiver of Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver is limited to

- .1 damages incurred by the Owner 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 profit arising directly from properly performed Work.

This mutual waiver is applicable to either party’s termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude an award of liquidated damages, when applicable, or other damages not expressly waived by the Owner in accordance with the requirements of the Contract Documents. The Owner and Contractor intend that this Section 15.1.7 be a mutual waiver, therefore the parties agree that, in the event that a court of competent jurisdiction or arbitrator holds that either party’s waiver of claims for consequential damages set forth in this section is void or unenforceable, in whole or part, then the waiver of consequential damages in this section shall also be void and unenforceable with respect to the other party, in which case both the Owner and Contractor shall preserve all claims for consequential damages.”

8.72 The first sentence of Section 15.2.1 is hereby amended and restated in its entirety to read as follows: “Claims, excluding those arising under Section 10.3, 10.4 and 11.5, shall be referred to the Initial Decision Maker for initial decision.”

8.73 The last sentence of Section 15.2.3 is hereby deleted in its entirety.

8.74 The following section is added after Section 15.4.4.3:

“§ **15.4.5** The parties shall be entitled to discovery in the arbitration, including, without limitation, document requests and depositions. The parties shall exchange a copy of all exhibits for the arbitration hearing and shall identify each witness who will testify at the arbitration, with a summary of the anticipated testimony of such witness ten days before the arbitration hearing. “

**Remainder of page intentionally left blank.
Signatures on following page.**

IN WITNESS WHEREOF, the parties have executed this Addendum to be effective as of the date first set forth above.

OWNER

GCAM, INC.,
a California corporation

CONTRACTOR

By: _____
Name: _____
Title: _____

By: _____
Name: _____
Title: _____

CONSTRUCTION AGREEMENT

This Construction Agreement (the "Agreement") is entered into as of _____, 2019 by and between GCAM, Inc., a California corporation, with its principal offices at 1561 Orangethorpe Avenue, Suite 215, Fullerton, California 92831 ("Owner") and Contractor identified below for the construction project identified below.

"Contractor": _____

 EIN: _____

"Project": _____

The other parties are also involved in the Project include (without limitation):

"Architect": _____

"Engineer": _____

"Consultant": _____

Owner and Contractor agree as follows:

ARTICLE I THE CONTRACT DOCUMENTS AND THE WORK OF THIS CONTRACT

1.1 Owner and Contractor agree to be bound by (i) this Agreement and AIA Document A201-2017, General Conditions of the Contract for Construction (as amended by the Addendum thereto), (ii) the project manual and specifications, drawings, specifications, addenda prepared by or for Owner (including all modifications thereto) provided to Contractor by Owner, (iii) Contractor's bidding documents accepted by Owner; and (iv) modifications to this Agreement agreed to by the parties (collectively, the "Contract Documents" or the "Contract"). The Contract Documents describe the construction work to be performed in connection with the

Project (the “Work”), and Contractor shall fully execute the Work, except as specifically indicated in the Contract Documents to be the responsibility of others. If there is any inconsistency between this Agreement (as amended by Sections 1 through 7 of the Addendum) and any other Contract Document (including AIA Document A201-2017, as amended by the Addendum), this Agreement shall control. The Contract Documents represent the entire and integrated agreement between the parties hereto and supersede all prior negotiations, representations or agreements, either written or oral. Contractor shall be furnished one (1) complete copy of the Contract Documents.

ARTICLE 2 CONTRACT SUM

2.1 Owner shall pay to Contractor in current funds for performance of Contractor’s Work the “Contract Sum” as indicated in Exhibit A subject to additions and deductions as provided in the Contract Documents.

ARTICLE 3 GENERAL OBLIGATIONS OF OWNER

3.1 SERVICES PROVIDED BY OWNER

3.1.1 Owner shall cooperate with Contractor in scheduling and performing Owner’s Work (and its other contractors’ Work) to avoid conflicts or interference in Contractor’s Work and shall expedite written responses to submittals made by Contractor in accordance with the Contract. Unless the parties have prepared and agreed on the construction schedule prior to the execution of this Agreement, as soon as practicable after the effective date of this Agreement, Owner shall provide Contractor copies of Owner’s construction schedule and schedule of submittals, together with such additional scheduling details as will enable Contractor to plan and perform Contractor’s Work properly. Contractor shall be notified promptly of subsequent changes in the construction and submittal schedules and additional scheduling details.

3.1.2 Owner shall cooperate with Contractor so that Contractor can secure suitable areas for storage of Contractor’s materials and equipment during the course of Contractor’s Work. Additional costs to Contractor resulting from relocation of such facilities at the direction of Owner, except as previously agreed upon, shall be borne by Contractor.

3.1.3 Except as otherwise provided herein, Owner’s equipment shall not be available to Contractor, except as agreed upon in writing by Owner and Contractor.

3.2 COMMUNICATIONS

3.2.1 Owner shall promptly make available to Contractor information which materially affects Contractor’s Work and which Owner gains knowledge of and which is not otherwise available to Contractor after this Agreement’s execution by the parties.

3.2.2 Owner shall not give instructions or orders directly to employees or workmen of

Contractor, except to persons designated as authorized representatives of Contractor.

3.2.3 Owner shall permit Contractor to request directly from Architect information regarding the percentages of completion and the amount certified on account of Work done by Contractor.

3.2.4 If hazardous substances of a type of which an employer is required by law to notify its employees are being used on the site by Owner, anyone directly or indirectly employed by it, Owner shall, prior to harmful exposure of Contractor's employees to such substance, give written notice of the chemical composition thereof to Contractor in sufficient detail and time to permit Contractor's compliance with such laws.

3.3 CLAIMS BY OWNER

3.3.1 Liquidated damages for delay, as provided for in Section 9.5 of this Agreement, shall be assessed against Contractor only to the extent caused by Contractor, Contractor's employees and agents, subcontractors, suppliers or any person or entity for whose acts Contractor may be liable, and in no case for delays or causes arising outside the scope of this Contract.

3.3.2 Except as may be indicated in this Agreement, Owner agrees that no claim for payment for services rendered or materials and equipment furnished by Owner to Contractor shall be valid without prior written notice to Contractor.

3.4 OWNER'S REMEDIES

3.4.1 If Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform a material provision of the Contract, after three (3) days written notice to Contractor and without prejudice to any other remedy Owner may have, Owner may make good such deficiencies and may deduct the reasonable cost thereof, including Owner's expenses, from the payment then or thereafter due Contractor.

3.4.2 In addition to any and all remedies available at law or equity and by the terms of this Agreement, upon breach of any term or condition of this Agreement by Contractor or by anyone acting under or through him, Owner may do any one or more of the following: (i) terminate this Agreement in accordance with Article 7 of this Agreement; (ii) declare Contractor in default of this Agreement; (iii) recover deficits remaining after application of such sums incurred, by cause of Contractor's default, from Contractor by whatever remedies may be available; (iv) apply a default interest rate on any deficits or balances unpaid longer than thirty (30) days by Contractor at the maximum rate allowable by law; and (v) recover amounts of attorney's fees incurred in the enforcement of this Agreement; amounts for additional administrative and overhead costs and amounts for liquidated damages incurred as a result of Contractor's default.

ARTICLE 4 GENERAL OBLIGATIONS OF CONTRACTOR

4.1 EXECUTION AND PROGRESS OF THE WORK

4.1.1 Contractor shall cooperate with Owner in scheduling and performing Contractor's Work to avoid conflict, delay in or interference with the Work of other contractors or Owner's own forces.

4.1.2 Contractor shall promptly submit shop drawings, product data, samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or other contractors.

4.1.3 Unless the parties have prepared and agreed on the schedule of values prior to the execution of this Agreement, Contractor shall submit to Owner, within five (5) days of the date of this Agreement and prior to commencement of the Work, whichever occurs first, and from time to time thereafter as requested by Owner, a schedule of values allocated to the various parts of the Work of this Contract, the total sum of which shall be the Contract Sum, made out in such detail as Owner and Contractor may agree upon or as required by Owner and supported by such evidence as Owner may request. Owner may require such schedules on the same terms and conditions for deletions, additions or modifications of the Work. In applying for payment, Contractor shall submit statements based upon such schedule(s).

4.1.4 Contractor shall furnish to Owner periodic progress reports on the Work of this Contract as mutually agreed, including information on the status of materials and equipment, which may be in the course of preparation or manufacture. Contractor shall notify Owner in writing, within five (5) days of this Agreement (and from time to time throughout the Project as Owner may require), of all equipment, product, material or coordination issue(s) which may, in any way, affect the overall schedule for the Project. Contractor represents and warrants that prior to the execution of the Agreement, Contractor disclosed to Owner all issues that Contractor was aware of (or should reasonably have been aware of) that may adversely affect the overall schedule for the Project.

4.1.5 Contractor shall timely pay for all materials, equipment and labor used in connection with the performance of this Contract when due, and shall furnish satisfactory evidence, when requested by Owner, to verify compliance with the above requirements. If Contractor has not timely paid for all materials, equipment and labor used in connection with the performance of this Contract when due, Contractor, upon request, shall immediately provide Owner a listing of all unpaid amounts, listing the name and address of each payee, the amount due each payee, and the reason the amount was not paid.

4.1.6 Contractor shall take necessary precautions to protect properly the Work of other contractors from damage caused by Contractor's Work and/or other activities under the Contract.

4.1.7 Contractor shall cooperate with Owner, other contractors and Owner's own forces whose Work might interfere with Contractor's Work. Contractor shall participate in the preparation of coordinated drawings in areas of congestion, if required by Owner; specifically noting and

advising Owner of potential conflicts between the Work of Contractor and that of other contractors or Owner's own forces.

4.1.8 Contractor shall supervise, perform, and direct Contractor's Work, using Contractor's best skill and attention. Contractor shall be responsible for, and have control over, construction means, methods, techniques, safety and other procedures as required to execute Contractor's Work. Contractor, when and as directed by Owner, shall provide every reasonable accommodation for coordination with other contractors performing Work as part of the Project which must be built in, or otherwise attached to, Contractor's Work.

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

4.1.10 Contractor shall examine the existing conditions and substrates affecting Contractor's portion of the Work. If a condition exists which is detrimental to the performance of the Work, Contractor shall immediately notify Owner, in writing, of such conditions prior to commencement of the Work. Commencement of any portion of the Work by Contractor constitutes acceptance of the existing conditions and substrates affecting the Work. No subsequent claims by Contractor resulting from such conditions will be considered.

4.2 LAWS, PERMITS, FEES AND NOTICES

4.2.1 Contractor shall give notices and comply with any and all laws, ordinances, rules, regulations and orders of public authorities bearing on performance of the Work of this Contract. Contractor shall secure and pay for permits and governmental fees, licenses and inspections necessary for proper execution and completion of Contractor's Work, the furnishing of which is reasonably requested by Owner.

4.2.2 Contractor shall comply with any and all federal, state and local tax laws, social security acts, unemployment compensation acts and workers' or workmen's compensation acts insofar as applicable to the performance of this Contract.

4.3 SAFETY PRECAUTIONS AND PROCEDURES

4.3.1 Contractor shall take reasonable safety precautions with respect to performance of Contractor's Work, shall comply with safety measures reasonably required by Owner and with all applicable laws, ordinances, rules, regulations and orders of public authorities for the safety of persons or property. Contractor shall report to Owner within three (3) days an injury to an employee or agent of Contractor, which occurred at the Project site.

4.3.2 If hazardous substances of a type of which an employer is required by law to notify its employees are being used on the site by Contractor, Contractor's subcontractors or anyone directly or indirectly employed by them, Contractor shall, prior to harmful exposure of any employees on the site to such substance, give written notice of the chemical composition thereof to Owner in sufficient detail and time to permit compliance with such laws by Owner, other

contractors and other persons on the site.

4.3.3 Contractor shall not be required to perform without consent any Work relating to any hazardous material, except as specifically provided in the Contract Documents. In the event Contractor encounters, on the site, material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous material which has not been rendered harmless, Contractor shall immediately stop any Work in the area affected and immediately report the condition to Owner in writing. The Work in the affected area shall immediately resume in the absence of asbestos, PCB or other hazardous material or when it has been rendered harmless, by written agreement of Owner and Contractor, or in accordance with final determination by Architect or by arbitration as provided in this Agreement.

4.4 Contractor shall keep the Project site and surrounding area free from accumulation of waste materials or rubbish caused by operations performed under this Agreement. At completion of the Work of this Contract, Contractor shall, at Contractor's expense, remove from and about the Project, tools, construction equipment, machinery, surplus materials (if directed to do so by Owner), and all remaining waste materials and rubbish.

4.5 WARRANTY

4.5.1 Contractor warrants to Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that Contractor's Work will be free from defects and that such Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized will be considered defective. This warranty shall be in addition to and not in limitation of any other warranty or remedy provided herein, at law or in equity. If this Agreement is terminated for any reason prior to the completion of the Work, Contractor's warranties in this Section 4.5.1 shall survive as to the portion of the Work that was completed prior to such termination, and the early termination of the Agreement will not void the warranties regarding the Work that has been completed.

4.5.2 Contractor shall perfect the right of Owner to any warranty available or to which Owner may be entitled by this Agreement, from subcontractors, their suppliers and anyone else acting under or through Contractor. Any such subcontractor or supplier warranties shall in no way limit or diminish any obligation of Contractor under this Agreement. This right may be enforced by Contractor or Owner.

4.6 INDEMNIFICATION

4.6.1 To the fullest extent permitted by law, Contractor shall indemnify and hold harmless 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 attorney's fees, arising out of or resulting from performance of Contractor's Work under this Contract, but only to the extent caused in whole or in part by negligent acts or omissions of Contractor, Contractor's subcontractors, 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 otherwise reduce other rights or obligations of indemnity, which would otherwise exist as to a party or person described in this Section 4.6.

4.6.2 In claims against any person or entity indemnified under this Section 4.6 by an employee of Contractor, Contractor's subcontractors, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 4.6 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for Contractor or Contractor's subcontractors under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts, and Contractor waives any immunity under applicable workers' compensation laws with respect to the Contractor's indemnity obligations hereunder.

4.6.3 The obligations of Contractor under this Section 4.6 shall not extend to the liability of Architect, Architect's consultants, and agents and employees of any of them arising out of (i) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (ii) the giving of or the failure to give directions or instructions by Architect, Architect's consultants, and agents and employees of any of them, provided such giving or failure to give is the primary cause of the injury or damage. The obligations of Contractor under this Section 4.6 shall survive termination of this Agreement.

4.7 CORRECTION OF WORK

4.7.1 Contractor agrees that Owner and Architect will have the authority to reject Work which does not conform to the Contract Documents. Architect's decision on matters relating to aesthetic effect shall be final if consistent with the intent expressed in the Contract Documents.

4.7.2 Contractor shall promptly correct Work rejected by Owner or Architect 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 and compensation for Architect's services and expenses made necessary thereby, shall be at Contractor's expense,

4.7.3 In addition to Contractor's obligations under Section 4.5, if, within one year after the date of Substantial Completion of the Work of this Agreement or designated portion thereof or after other dates for commencement of warranties established by this Agreement, 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 Owner to do so whether or not Owner has previously given Contractor a written acceptance of such condition. Owner shall give such notice promptly after discovery of the condition.

4.7.4 If Contractor fails to correct nonconforming Work within a reasonable time (based on the nature of such nonconforming Work), Owner may correct it in accordance with Section 3.4.

4.7.5 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 performance of the Work.

4.7.6 The one-year period for correction of Work shall also be extended by corrective Work performed by Contractor pursuant to this Section 4.7 such that if, within one year after completion of the corrective Work, any of the corrective Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner.

4.8 Contractor shall provide all temporary facilities, equipment and services Contractor may require to properly complete all of Contractor's obligations under this Agreement, except as otherwise specifically provided in this Agreement.

4.9 Owner may require Contractor to enter into agreements with subcontractors performing portions of the Work that Contractor has agreed to provide pursuant to the Contract Documents, and any such subcontractor shall be bound by the terms of the Contract Documents to the extent of the Work to be performed by the subcontractor, assuming toward Owner all obligations and responsibilities which Contractor has toward Owner and Owner shall have the benefit of all rights, remedies and redress against the subcontractor that Owner has against Contractor under the Contract Documents.

ARTICLE 5 CHANGES IN THE WORK

5.1 Owner may make changes in the Work by issuing modifications to the Contract Documents. Upon receipt of such a modification issued subsequent to the execution of the Agreement, Owner shall promptly notify Contractor of the modification. Unless otherwise directed by Owner, Contractor shall not thereafter order materials or perform Work which would be inconsistent with the changes made by the modifications to the Contract Documents.

5.2 Contractor may be ordered in writing by Owner, without invalidating this Contract, to make changes in the Work within the general scope of this Contract consisting of additions, deletions or other revisions, with the Contract Sum and the Contract Time being adjusted accordingly. Contractor, prior to the commencement of such changed or revised Work, shall submit promptly to Owner written copies of a claim for adjustment to the Contract Sum and Contract Time for such revised Work in a manner consistent with requirements of the Contract Documents. Contractor shall not commence such changed or revised Work until the claim for adjustment is approved in writing by Owner. All modifications to the Contract Sum shall be calculated at cost, plus no more than fifteen percent (15%) for overhead and profit.

5.3 Owner shall, have the right and option of causing additions or modifications of the Work within or without the general scope of this Agreement to be done by a party other than Contractor.

5.4 Contractor shall make claims promptly to Owner for additional cost and extensions of time necessitated by such modifications in accordance with the Contract Documents.

ARTICLE 6 DISPUTE RESOLUTION

6.1 Any controversy or claim between Owner and Contractor arising out of or related to this Contract or the breach thereof, shall be settled by arbitration, the terms of which are set forth in AIA Document A201-2017, General Conditions of the Contract for Construction (as amended by the Addendum thereto).

6.2 Except by written consent of the person or entity sought to be joined, no arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, any person or entity not a party to the Agreement under which such arbitration arises, unless it is shown at the time the demand for arbitration is filed that (1) such person or entity is substantially involved in a common question or fact or law, (2) the presence of such person or entity is required if complete relief is to be accorded in the arbitration, (3) the interest or responsibility of such person or entity in the matter is not insubstantial, and (4) such person or entity is not Architect, Architect's employee, Architect's consultant, or an employee or agent of any of them. This agreement to arbitrate and any other written agreement to arbitrate with an additional person or persons referred to herein shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

6.3 Owner shall give Contractor prompt written notice of any demand received or made by Owner for arbitration if the dispute involves or relates to the Work, materials, equipment, rights or responsibilities of Contractor.

6.4 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.

ARTICLE 7 TERMINATION, SUSPENSION OR ASSIGNMENT OF THE CONTRACT

7.1 TERMINATION BY OWNER

7.1.1 Owner may terminate the Contract if Contractor: (i) refuses or fails to supply enough properly skilled workers or proper materials; (ii) fails to make timely payment to subcontractors, suppliers, materialmen, etc. for materials or labor in accordance with the respective agreements between Contractor and such other persons or entities; (iii) disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or (iv) otherwise is guilty of substantial breach of a provision of the Contract Documents.

7.1.2 When any of the above reasons exists, Owner may, without prejudice to any other remedy Owner may have and after giving Contractor seven (7) days' written notice, terminate the Contract and take possession of the site and of all materials, equipment, and tools thereon owned by Contractor and may finish the Work of the Contract by whatever reasonable method Owner may deem expedient.

7.1.3 When Owner terminates the Contract for one of the reasons stated in Section 7.1.1, Contractor shall not be entitled to receive further payment until the Work of the Contract is finished.

7.1.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work of the Contract, including other damages incurred by Owner, plus 15% of all such costs and expenses for Owner's administrative expenses, such excess shall be paid to Contractor. If such costs and damages exceed the unpaid balance, Contractor shall pay the difference to Owner. The amount to be paid to Owner or Contractor, as the case may be, shall be certified by Architect, upon application, and this obligation for payment shall survive termination of the Contract.

7.2 Contractor shall not assign the Work of this Contract without the written consent of Owner, nor subcontract the whole of this Contract, nor further subcontract portions of this Contract without the written consent of Owner.

7.3. If the Contract is terminated for Owner's convenience in accordance with Article 14 of AIA Document A201-2017, then Contractor shall recover from Owner payment for (i) Work executed, including 15% overhead and profit on total Project costs incurred by Contractor as of the date of Contractor's receipt of the termination notice and (ii) actual demobilization cost not to exceed \$5,000. Contractor shall not be entitled to lost or anticipated profit on unperformed Work.

7.4 The Work may be suspended by Owner as provided in Article 14 of AIA Document A201-2017.

ARTICLE 8 THE WORK OF THIS CONTRACT

8.1 Contractor shall execute the following portion of the Work described in the Contract Documents, including all labor, materials, equipment, services and other items required to complete such portion of the Work, except to the extent specifically indicated in the Contract Documents to be the responsibility of others. Subject to the terms and conditions of the Agreement, this Contractor's Work includes, but is not limited to the following: (i) all permits, fees, inspections, approvals, etc., (ii) daily clean up at the Project site, (iii) shop drawings and other submittals, (iv) cutting and patching; and (v) all caulking and sealing as required to fully complete and perform Contractor's Work.

8.2 In addition to the Scope of Work indicated in Section 8.1, Contractor agrees to perform the work as indicated in Exhibit A attached to this Agreement.

ARTICLE 9 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

9.1 Contractor's date of commencement is the date of this Agreement, as first written above, unless a different date is stated below or a provision is made for the date to be fixed in a notice to proceed issued by Owner.

9.2 Unless the date of commencement is established by a notice to proceed issued by Owner, or Owner has commenced visible Work at the Project site, Contractor shall notify Owner in writing not less than ten (10) days before commencing Contractor's Work to permit the timely filing of notices.

9.3 Time limits stated in Exhibit C attached hereto and elsewhere in the Contract Documents (the "Contract Time") are of the essence of the Contract. By executing the Agreement, Contractor confirms that the Contract Time is a reasonable period for performing the Work of the Contract.

9.4 Contractor's Work shall be substantially completed no later than as indicated on Exhibit C attached to this Agreement

9.5 No extension of time will be valid without Owner's written consent and only then after claim made by Contractor in accordance with Section 5.2. Contractor acknowledges that completion of the Work in a timely manner is of critical importance to Owner and that Contractor's failure to achieve Substantial Completion of the Work within the Contract Time as such Contract Time may be adjusted pursuant to the terms of the Contract Documents will cause Owner to suffer substantial damages, but it is impractical or extremely difficult to fix the amount of such damages. As a result, Owner and Contractor agree that a reasonable measure of the damages to be sustained by Owner during the period of any delay in Substantial Completion of the Work within the Contract Time as such Contract Time may be adjusted pursuant to the terms of the Contract Documents shall be in the amount set forth below:

Calendar Days 1 thru 5	\$500/day
Calendar Days 6 thru 10	\$1,000/day
Calendar Days 11 thru 15	\$1,500/day
Calendar Days 6 thru 20	\$2,000/day
Beyond 20 days	\$2,500/day

Any amounts calculated under this provision may be deducted from the amounts otherwise due to Contractor under this Agreement. If the amount then owing to Contractor under this Agreement is insufficient to cover the full amount of such liquidated damages, then Contractor shall pay such amounts to Owner within thirty (30) days following receipt of a written demand therefor.

ARTICLE 10 PAYMENT

10.1 Owner shall make payments to Contractor, as follows:

10.1.1 In a manner consistent with the Deliverable Based Draw Schedule (Work Packages), set forth in Exhibit B attached to this Agreement.

10.1.2 Subject to approval of the Work by Architect, and all supervisory agents and authorized representatives of Architects and Owner, up to ninety percent (90%) of the Contract Sum shall be

paid following Substantial Completion of the Work by Contractor. Applications for payment must be received on or before the fifth (5th) day of the month following Substantial Completion for processing by the fifth (5th) day of the following month. Owner shall withhold ten percent (10%) of the Contract Sum from the payment(s) otherwise due as retainage.

10.1.3 Likewise subject to the same approvals and provisions and in accordance with Sections 10.11 and 10.12, the retainage of ten percent (10%) of the Contract Sum shall be paid to Contractor following full completion and performance of the Work.

10.4 Applications for payment shall be submitted on documents provided by Owner and in accordance with the Contract Documents.

10.5 If an application for payment is received by Owner after the application dates fixed above, Contractor's Work covered by it shall be included by Owner in the next application for payment submitted to Architect.

10.6 Each application for payment shall be subject to submission by Contractor to Owner of such documents and affidavits as shall be reasonable acceptable to Owner, waiving all lien rights (such lien waivers being limited to the amount of the payment and conditioned upon the actual receipt by Contractor of the payment covered by the lien waiver), if any, affirming the balance of the Contract Sum due Contractor, releasing Owner and all supervisory agents and authorized representatives of Owner, as well as their employees and agents, from claim of Contractor, evidencing and/or warranting full and complete payment of all liabilities of the Contract with respect to Contractor's Work, including wages, taxes, material and labor bills, indemnifying said parties from liability for these matters as well as claims by anyone acting under or through Contractor, and warranting and providing such other information, affidavits and documents as Owner may require.

10.7 Each application for payment shall be based upon the most recent schedule of values submitted by Contractor and approved by Owner in accordance with Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of Contractor's Work and be prepared in such form and supported by such data to substantiate its accuracy as Owner may require. This schedule, unless objected to by Owner, shall be used as a basis for reviewing Contractor's applications for payment.

10.9 Each application for payment submitted by Contractor shall indicate the percentage of completion of each portion of Contractor's Work as of the end of the period covered by the application for payment.

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

10.11 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by Owner to Contractor when Contractor's Work is fully completed and performed in accordance with the requirements of the Contract Documents.

10.12 Before issuance of the final payment, Contractor shall submit, in addition to other requirements of the Contract Documents, evidence satisfactory to Owner that all payrolls, bills for materials and equipment, and all indebtedness connected with Contractor's Work have been satisfied.

ARTICLE 11 INSURANCE

11.1 Owner's Insurance. Unless the parties mutually agree to have Contractor obtain the insurance policy described in this Section, Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. Such insurance shall be maintained until Substantial Completion and upon Substantial Completion, Owner shall either continue such insurance or, if necessary, replace such insurance with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work under Section 12.2.2 of AIA Document A201-2017, General Conditions of the Contract for Construction.

11.2 Contractor's Insurance

11.2.1 Contractor shall provide Owner within five (5) days of the date of this Agreement and prior to commencement of Contractor's Work, whichever first occurs, and from time to time as requested by Owner, current Accord form of Certificates of Insurance evidencing the coverages required by this Article 11.

11.2.2 Contractor shall, at its expense, provide and maintain during the term of this Agreement: (1) Workers' Compensation Insurance in accordance with Statutory Employers Liability and all applicable laws, rules, and regulations of the jurisdiction in which the Project is located. Statutory Employers Liability shall be as follows, or in the minimum amount required by law, whichever is greater: \$1,000,000 Each Accident Bodily Injury, \$1,000,000 Policy Limit Bodily Injury by Disease and \$1,000,000 Each Employee Bodily Injury by Disease; (2) Commercial General Liability Insurance which includes completed operations and premises operations coverage and which provides bodily injury / property damage in the amount of \$2,000,000.00 (CSL) for each occurrence and \$5,000,000.00 (CSL) general aggregate, and which includes Owner as additional insured by Standard Endorsement CG 2010 or its equivalent, which will be primary and noncontributory with Owner's insurance; (3) automobile liability insurance covering vehicles owned, and non-owned vehicles used, by Contractor, with policy limits of not less than \$1,000,000 per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage; (4) all insurance required by law and regulatory agencies and entities; (5) asbestos and hazardous material abatement liability insurance, with policy limits

reasonably acceptable to Owner, for liability arising from the encapsulation, removal, handling, storage, transportation and disposal of asbestos and hazardous materials and (6) such other insurance, if any, as may be required by this Agreement. Contractor shall also provide a copy of the additional insured endorsement before commencing Work.

11.2.3 Coverages shall be written on an occurrence basis, and shall be maintained without interruption from date of commencement of Contractor's Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.2.4 Certificates of insurance and the insurance policies filed with Owner in accordance with this Article 11 shall contain a provision that coverages worded under the policies will not be cancelled or allowed to expire until at least thirty (30) days prior written notice has been given to Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment as required in Article 10. If any information concerning reduction of coverage is not furnished by the Insurer, it shall be furnished by Contractor with reasonable promptness.

11.2.5 Waivers of Subrogation. To the full extent permissible by law, 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) Architect, Architect's consultants, and any of their subcontractors, sub-subcontractors, agents and employees for damages caused by fire or other perils to the extent covered by other property insurance applicable to the Work, except such rights as they may have to proceeds of such insurance held by Owner as fiduciary. Contractor shall require of Contractor's subcontractors, agents and employees, by appropriate agreements, written where legally required for validity, similar waivers 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.

11.2.6 All insurance policies shall be issued and countersigned by duly authorized representatives of such companies and, except for Professional Liability, shall be written on ISO standard forms or their equivalent. Additionally, all insurance under this Section must be issued by an insurance company authorized to do business in the State where the Project is located and have an AM Best rating of A-, VII or higher. Contractor shall require all sub-contractors and consultants, providing services on the Project to carry any and all insurance coverage that adequately covers each consultant's exposure based on the type of services they are providing in connection with the Project. In addition, Contractor shall notify Owner, in writing, of any reduction in the aggregate coverage provided by Contractor's insurance within (30) days after each such revision in coverage. In the event Contractor or its sub-contractors fail to maintain the insurance required hereby, Owner may, at its discretion, pay any premium necessary to maintain the coverage required hereby and deduct such premium costs from the Contractor's fees under this Agreement.

11.2.7 The absence of a demand for any type of insurance certificates or policy or insurance condition, or for higher coverage limits shall not be construed as a waiver of Contractor's obligations to carry and maintain the appropriate types of insurances at limits that are appropriate to the liability exposure associated with this Agreement. Owner does not represent that coverage and the limits specified herein will necessarily be adequate to cover Contractor's liability.

11.2.8 Contractor's insurance certificate(s) shall indicate that the Commercial General Liability policy carries an endorsement which names Owner and its directors, officers, employees and agents, as additional insureds. Contractor's policy(ies) shall be primary and any insurance carried by Owner shall be noncontributing with respect thereto.

11.2.9 Contractor's Commercial General Liability Insurance policy shall be occurrence form and shall have a deductible not to exceed Five Thousand Dollars (\$5,000) per occurrence. Contractor's Professional Liability Insurance policy shall be occurrence form (if the insurance is written on a claims-made form, it shall continue for five (5) years following the completion of the performance or the attempted performance of the provisions of this Agreement, if available at a reasonable cost). The insurance shall have a retroactive date of placement prior to or coinciding with the effective date of the Agreement between Owner and Contractor. If the coverage is canceled or non-renewed and not replaced with another claims-made policy form with a retroactive date prior to the effective date or coinciding with the effective date of the Agreement Contractor must purchase Extended Reporting ("Tail") coverage for a minimum of five (5) years following the completion of the performance or the attempted performance of the provisions of the Agreement.

ARTICLE 12 MISCELLANEOUS PROVISIONS

12.1 Where reference is made in this Agreement to another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

12.2 Waiver of any obligation of Contractor by Owner shall not constitute waiver of the same subsequent obligation of Contractor or of any other obligation of Contractor.

12.4 This Agreement may be modified only by written agreement signed by Owner and Contractor.

12.5 Owner shall be entitled to recover reasonable attorney's fees incurred in the enforcement of this Agreement.

12.5 The primary venue of any action to enforce this Agreement shall be the county and the state in which the Project is located.

12.6 The language in all parts of this Agreement shall be in all cases construed as a whole according to its fair meaning and not strictly for or against either Owner or Contractor.

IN WITNESS WHEREOF, the parties hereto have made and entered into this Agreement as of the day and year first written above.

OWNER

GCAM, Inc.

By: _____
Name:
Title:

CONTRACTOR

By: _____
Name:
Title:

EXHIBIT A
SCOPE OF WORK AND CONTRACT SUM

EXHIBIT B
DELIVERABLE BASED DRAW SCHEDULE (WORK PACKAGE)

EXHIBIT C
CONTRACT TIME

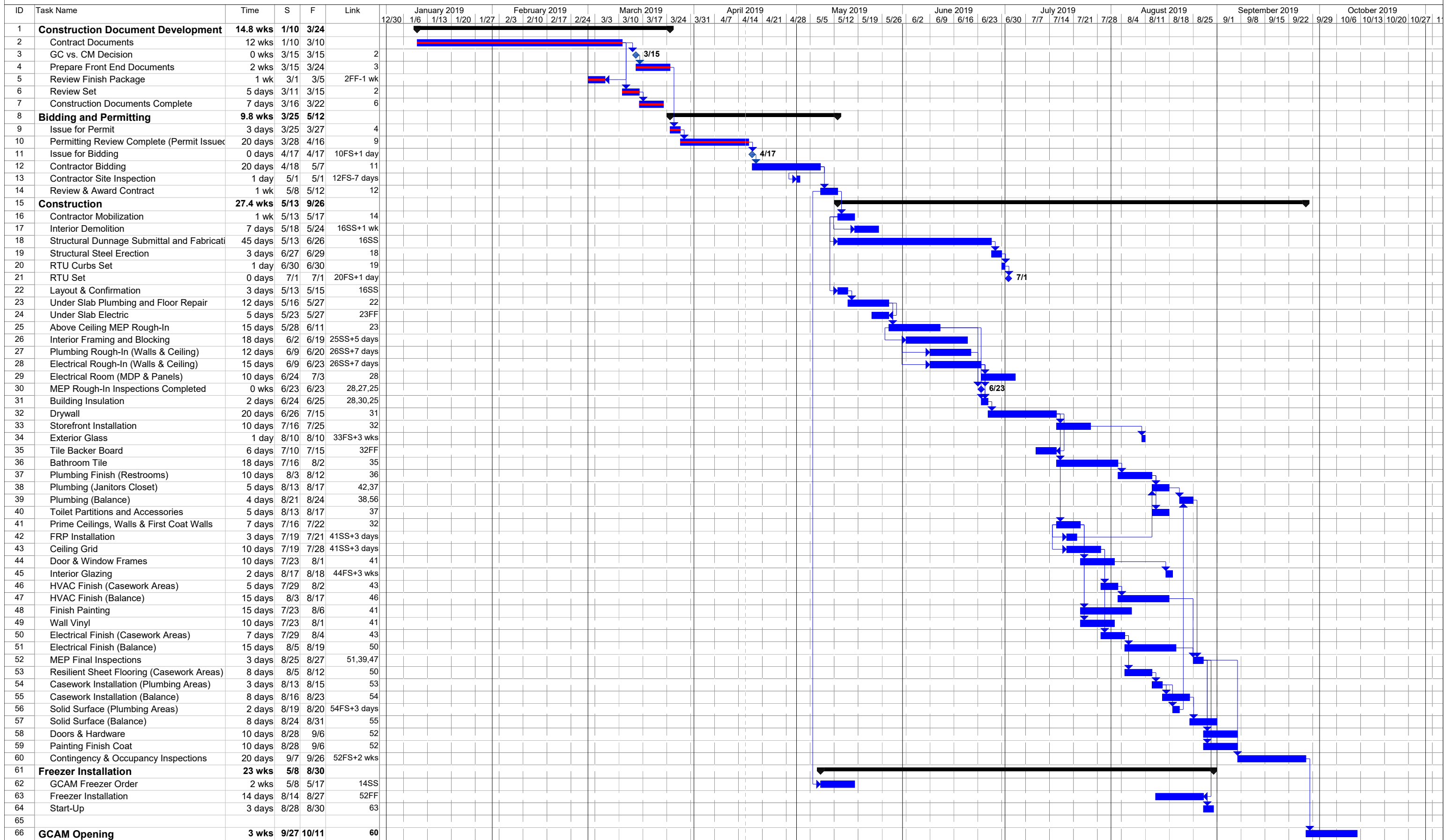
Date of Commencement	_____
Date of Substantial Completion	_____

EXHIBIT A
SCOPE OF WORK AND CONTRACT SUM

EXHIBIT B
DELIVERABLE BASED DRAW SCHEDULE (WORK PACKAGE)

GCAM Edinburg, TX Plasma Collection Center - Issued for Bidding

GCAM Edinburg TX Schedule REV03 041619



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A1.00 LIFE SAFETY PLAN & CODE NOTES

A1.01 FLOOR PLAN AND DETAILS

A1.02 ROOF PLAN AND DETAILS

A1.03 REFLECTED CEILING PLAN AND DETAILS

A2.01 ELEVATIONS

A3.01 WALL TYPES

A4.01 DETAILS

A5.01 TOILET ROOM PLANS AND ELEVATIONS

A6.01 DOOR SCHEDULE AND DETAILS

A7.01 FLOOR FINISH PLANS

A7.02 FINISH SCHEDULES

A7.03 CASEWORK PLANS

A7.11 CASEWORK ELEVATIONS

A7.12 CASEWORK ELEVATIONS

A7.13 CASEWORK ELEVATIONS

A7.21 CASEWORK SECTIONS AND DETAILS

A7.22 CASEWORK SECTIONS AND DETAILS

F1.01 F. F. & E. AND SECURITY PLAN

F1.02 SIGNAGE PLAN AND DETAILS

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S2 NEW OPENING / FRAMING PLAN

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P1.01 WASTE AND VENT PLAN

P2.01 WATER PLAN

P5.01 PLUMBING DETAILS

P6.01 PLUMBING SCHEDULES

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M6.02 MECHANICAL SCHEDULES

M8.01 MECHANICAL COMCHECK

ELECTRICAL

E0.01 ELECTRICAL COVER SHEET

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E2.02 ELECTRICAL POWER PLAN

E2.03 DATA PLAN

E2.04 DATA PLAN

E5.01 ELECTRICAL DETAILS

E5.02 ELECTRICAL DETAILS

E6.01 ELECTRICAL SCHEDULES AND RISER DIAGRAM

E8.01 ENERGY CODE COMPLIANCE

END OF SECTION

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Owner-furnished products.
4. Access to site and use of premises.
5. Work restrictions.
6. Specification and drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification: The project consists of the alteration of a single tenant lease space in an existing building, for the purposes of establishing the Green Cross Plasmapheresis Center, a blood plasma donation and collection facility for Green Cross America Plasma (GCAM).

1. Project Location: 419 E. University Drive, Edinburg, TX 78539.

B. Project Owner/Lessee: GCAM, Inc., 1561 E. Orangethorpe Ave., Suite 205, Fullerton, CA 92831.

1. Voice: 714-738-6462
2. Facsimile:

C. Architect: Casler Design Group, 10805 Indeco Drive, Cincinnati, Ohio 45241.

1. Voice: 513-791-0456
2. Facsimile: 513-792-7488

D. Other Consultants: the following design professionals who have prepared designated portions of the Contract Documents:

1. Mechanical and Electrical Engineers: PE Services, Inc., 9 North Broadway, Lebanon, Ohio 45036.
 - a) Voice: 513-836-3810.
 - b) Facsimile: 886-996-9620
2. Structural Engineers: Mendoza Engineering, PLLC. 6316 North 10th, Suite 101, Building A, McAllen, Texas 78504.
 - c) Voice: 956-631-4906.
 - d) Facsimile: 956-994-8467

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents and consists of the following:
1. Installation of utility service connections from existing utilities at the project location, including domestic water, natural gas, and electric services.
 2. Minor modifications to building envelope consisting of structural reinforcement for installation of roof mounted equipment and equipment supports.
 3. Installation of aluminum entrance and storefront framing and glazing systems.
 4. Installation of aluminum windows.
 5. Construction of gypsum drywall partitions.
 6. Installation of wood and steel doors in steel and aluminum frames, including door hardware.
 7. Installation of plastic-laminate finish casework and solid surface counter tops.
 8. Installation of finish materials, including ceramic tile, carpet, resilient sheet flooring, resilient tile flooring, suspended acoustic panel ceilings, resilient wall base and accessories, painting, and wall coverings.
 9. Installation of toilet compartments and toilet accessories.
 10. Installation of wall surface protection systems.
 11. Flashing and sealing of roof penetrations.
 12. Installation of plumbing piping for rough-in of supply, waste, and vent lines, and installation of plumbing fixtures and trim.
 13. Installation of HVAC systems, including rooftop units, exhaust fans, supply and return ductwork, curbs and temperature controls.
 14. Installation of electrical service and distribution system, including switchgear, meters, disconnects, and panels.
 15. Installation of electrical power distribution system for equipment, roof top HVAC units, exhaust fans, freezer units, condensers, compressors, and other new equipment.
 16. Installation of electrical power distribution system, including devices and trim.
 17. Installation of lighting fixtures, including power wiring and controls.
 18. Installation of voice, data and communications including low voltage wiring and devices, labeling of devices and cables.
 19. Installation of pre-fabricated walk-in freezer equipment and related systems.
 20. Design and documentation for sprinkler system modifications and work required to modify existing system to suite tenant layout.
- B. Type of Contract
1. Project will be constructed under a single prime contract between the Owner and Contractor.

1.4 CONSTRUCTION PERIOD

- A. The construction period allocated for completion of all work indicated in the Contract Documents is 137 calendar days from the date of Commencement of Construction to date of Substantial Completion.
- B. Refer to Construction schedule, included in the Project Manual, for intended schedule of the Work.

1.5 CONSTRUCTION COST BREAKDOWNS

- A. Each Contractor shall assist the Owner in providing construction cost breakdowns for the identification of specific items identified on the contract documents that are directly related to the installation of building tenant-related work.
- B. The Owner and Architect will provide documentation of building tenant-related work items to each Contractor to facilitate preparation of construction cost breakdowns.

1.6 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.7 PRODUCTS FURNISHED BY OTHERS

- A. For products furnished by others for installation by certain Contractors under their contract (as indicated on drawings):
 - 1. Product Supplier will arrange for and deliver shop drawings, product data, and samples to Owner and Contractor.
 - 2. Product Supplier will arrange and pay for delivery of products, according to Owner's Construction Schedule.
 - 3. After delivery, Contractor will inspect delivered items for damage. Contractor shall notify Owner immediately of any damage that is encountered.
 - 4. If products are damaged, defective, or missing, Product Supplier will arrange for replacement.
 - 5. Product Supplier will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Owner and Contractor.
 - 6. Owner will furnish Contractor the earliest possible delivery date for products furnished by others. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of products furnished by others in Owner's Construction Schedule.
 - 7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Owner and Architect noting discrepancies or anticipated problems in use of product.
 - 8. Contractor is responsible for receiving, unloading, and handling products furnished by others at Project site.
 - 9. Contractor is responsible for protecting products furnished by others from damage during storage and handling, including damage from exposure to the elements.
 - 10. If products furnished by others are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 - 11. Contractor shall install and otherwise incorporate installation of products furnished by others into the Work.

1.8 ACCESS TO SITE AND USE OF PREMISES

- A. General: Owner and all Contractors shall have full use of premises for construction operations, including use of Project site, during Construction Period. Owner's and Contractors' use of

premises is limited only by Owner's right to perform work or to retain other Contractors on portions of project.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The specifications are organized into divisions and sections using the 50-Division format and CSI/CSC'S "Masterformat" numbering system. These conventions are as follows:
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the project manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue through Owner supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 5 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include an updated statement that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
5. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Owner's construction schedule.
 - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Owner at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Owner's Construction Schedule and the Project Manual table of contents. Provide multiple line items for principal subcontract amounts where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. 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. Note specific requirements indicated below for each application.
- B. Payment Application Times: Progress payments shall be submitted to Architect by the tenth of the month.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three 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.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Owner's construction schedule.
 4. Products list.
 5. Submittal schedule.
 6. List of Owner's staff assignments.
 7. List of Owner's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

10. Certificates of insurance and insurance policies.
- G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 3. Occupancy permits and similar approvals.
 4. Warranties (guarantees) and maintenance agreements.
 5. Test/adjust/balance records.
 6. Maintenance instructions.
 7. Meter readings.
 8. Start-up performance reports.
 9. Changeover information related to Owner's occupancy, use, operation, and maintenance.
 10. Final cleaning.
 11. Application for reduction of retainage.
 12. Advice on shifting insurance coverages.
 13. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Completion of items specified for completion after Substantial Completion.
 4. Ensure that unsettled claims will be settled.
 5. Ensure that incomplete Work is not accepted and will be completed without undue delay.
 6. Removal of temporary facilities and services.
 7. Removal of surplus materials, rubbish, and similar elements.
 8. Change of door locks to Owner's access.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Owner's construction schedule.
 - 2. Submittals schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 SUBMITTALS

- A. Submittals Schedule: Submit required submittals in the following format:
1. Scheduled date for first submittal.
 2. Specification Section number and title.
 3. Submittal category (action or informational).
 4. Name of subcontractor.
 5. Description of the Work covered.
 6. Scheduled date for Architect's and Owner's final release or approval.
 7. Three paper copies.
- B. Owner's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit three copies at weekly intervals.
- D. Material Location Reports: Submit three copies at monthly intervals.
- E. Field Condition Reports: Submit three copies at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Owner's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE, GENERAL

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

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and the list of products as well as the Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for the Architect's final release or approval.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and 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.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

2.2 OWNER'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC'S "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Owner's Construction Schedule with submittals schedule.
 3. Substantial Completion: Indicate completion in advance of date established for substantial completion, and allow time for Architect's and Owner's administrative procedures necessary for certification of Substantial Completion.
 4. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

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

2.3 OWNER'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within **30** days of date established for commencement of the Work. Base schedule on the start-up construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. Approximate count of personnel at Project site.
 - 3. Equipment at Project site.
 - 4. Material deliveries.
 - 5. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 6. Accidents.
 - 7. Meetings and significant decisions.
 - 8. Unusual events (refer to special reports).
 - 9. Stoppages, delays, shortages, and losses.
 - 10. Meter readings and similar recordings.
 - 11. Emergency procedures.
 - 12. Orders and requests of authorities having jurisdiction.
 - 13. Change Orders received and implemented.
 - 14. Change Directives received and implemented.
 - 15. Services connected and disconnected.
 - 16. Equipment or system tests and startups.
 - 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for

Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 OWNER'S CONSTRUCTION SCHEDULE

- A. Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Owner's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Owner's responsive action. Submittals may be rejected for not complying with requirements.
- C. 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.
- D. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- E. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect and Owner reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 3. Submit electronic submittals via email as PDF electronic files.
 - a. Architect, through Owner, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

- B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 1 week for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 1 week for review of each resubmittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect and Owner.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect and Owner.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
- E. Deviations: highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Transmittal: package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect and Owner will not accept submittals received from sources other than Contractor.
 - 1. Transmittal Form: On the form, or an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal. Include Contractor's certification that information complies with Contract Document requirements.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit action submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product Specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 5. Submit electronic files in PDF format.
 - a. Architect, through Owner, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 6. Distribution: Furnish copies of final submittal to Installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.
- C. Shop Drawings: prepare project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.

- m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 - 3. Number of Copies: Submit electronic files in PDF format for the Architect's review.
 - a. Architect, through Owner, will return annotated file. Retain one copy of file as an electronic Project record document file.
 - 4. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.
 - 3. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. 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.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - 4. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
 - a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
 - 5. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit **3** sets. The Architect will return two sets marked with the action taken.
 - 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

- b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
 - c. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - d. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 7. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, Installers, and others as required for performance of the Work. Show distribution on transmittal forms.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Owner's action.
- F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit informational submittals required by other Specification Sections.
 - 1. Number of Copies: Submit electronic copy of each submittal, unless otherwise indicated. Architect and Owner will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Owner's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation And Maintenance Data."

- Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- R. Manufacturer's instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.3 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other sections of the Specifications.
- B. Certifications: Where other sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 - 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 01 Section "Quality Requirements."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner. Owner will forward to Architect for review.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND OWNER'S ACTION

- A. General: Architect and Owner will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action submittals: Architect and Owner will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "Approved," or "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - 2. Final-but-Restricted Release: When the Architect marks a submittal "Furnish As Corrected," "Exceptions Noted," or "Note Markings," 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 payment depends on that compliance.
 - 3. Returned for Resubmittal: When the Architect marks a submittal "Revise Per Comments," "Revise and Resubmit," or "Rejected," do not proceed with work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Revise Per Comments," "Revise and Resubmit," or "Rejected" at the Project site or elsewhere where work is in progress.
- C. Informational Submittals: Architect and Owner will review each submittal and will not return it or will return it if it does not comply with requirements. Architect and Owner will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Owner.
- C. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Timeschedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.

2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

- A. Tests and inspections not explicitly assigned to another identified entity are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Costs for these services are included in the Contract Sum.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- B. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- C. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. **Testing Agency Responsibilities:** Cooperate with Architect, Owner, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect, Owner, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- E. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Owner, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Owner, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Owner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- J. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the Architect before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement is most stringent.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Temporary heat.
 - 4. Ventilation.
 - 5. Telephone service.
 - 6. Sanitary facilities, including drinking water.
- C. Support facilities include, but are not limited to, the following:
 - 1. Field office and storage facilities.
 - 2. Temporary project identification signs and bulletin boards.
 - 3. Waste disposal services.
 - 4. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, and lights.
 - 3. Enclosure fence for the site.
 - 4. Environmental protection.

1.2 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within 10 days of the date established for Commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following.
 - 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 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series Standards for "Safety Requirements For Construction And Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
- C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- D. Tests and Inspections: Arrange For authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."
- C. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated. Retain first paragraph below if polyethylene sheet temporary partitions for enclosure or dust control are specified.
 - 1. For safety barriers and similar uses, provide minimum 5/8-inch-thick exterior plywood.
- D. Paint: Comply with requirements in Division 09 Painting Sections.
 - 1. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
- E. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110to 120-volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- G. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
 - 1. Provide separate facilities for male and female personnel.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction.
 - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 - 4. Use Charges: Cost or use charges for utilities required for the duration of the project, whether provided through existing services or temporary facilities, are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for change orders.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use.
 - 1. Sterilization: Sterilize temporary water piping prior to use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
- E. 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.

- F. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply
- G. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Except where the Owner authorizes use of the permanent system, provide vented, self-contained, lp-gas or fuel-oil heaters with individual space thermostatic control.
 - 2. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
- H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations when main building electric power service is not in operation. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - 1. Install electric power service underground, unless otherwise indicated.
 - 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, ac 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- J. Lighting: When overhead roof deck has been installed, provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office and first-aid station.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - b. Provide a dedicated telephone line for each computer in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
- L. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities:

1. Provide DSL or T-1 line in primary field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Locate field office, storage facilities, and other temporary construction and support facilities for easy access.
 1. Maintain support facilities until near substantial completion. Remove before substantial completion. Personnel remaining after substantial completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Field Office: Provide temporary offices of sufficient size to accommodate required office personnel at the project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 1. Furniture required for project-site documents including desk, chairs, file cabinets, plan tables, plan racks, and bookcases.
- C. Project Identification and Temporary Signs: Provide project identification and other signs of size indicated. Install signs where indicated to inform public and individuals seeking entrance to project. Unauthorized signs are not permitted.
 1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details furnished by Architect.
 2. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- D. Collection and Disposal Of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.
- B. Security Enclosure and Lockup: Install Substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 1. Where heating is needed and permanent enclosure is not complete, insulate temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 2. Close openings through roof deck and horizontal surfaces with load-bearing, wood-framed construction.
- E. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 “Standard For Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations.”
 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than two extinguishers for the project site.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Owner's construction schedule and the submittals schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.

- c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 3. Initial Submittal: Within 10 days after date of commencement of the Work, submit electronic copy of initial product list. Include a written explanation for omissions of data and for variations from contract requirements.
 4. Architect's Action: Architect will respond in writing to Contractor within 10 days of receipt of product list. No response within this period constitutes no objection to listed manufacturers or products. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Request Submittal: Requests for substitution will be considered if received within 30 days after commencement of the Work. Requests received more than 30 days after commencement of the Work may be considered or rejected at the discretion of the Owner and Architect.
- C. Substitution Requests: Submit three copies of each request for consideration. Submit requests in the form and in accordance with procedures required for change order proposals. Identify product or fabrication or installation method to be replaced. Include specification section number and title and drawing numbers and titles.
1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and Owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall contract time. If specified product or method of construction cannot be provided within the contract time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the contract sum.

- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- D. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include specification section number and title and drawing numbers and titles.
 - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- E. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
- B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- F. Warranties specified in other sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- G. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the specifications, prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- H. Submittal Time: Submit written warranties to the Architect prior to the date certified for tenant occupancy of the premises. If the Architect's certificate of substantial completion designates a commencement date for warranties other than the date indicated, submit written warranties upon request of the Architect
 - 1. Commencement date for all warranties shall be the date of tenant occupancy of the premises.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Where specifications name only a single proprietary product or manufacturer (and indicated with "NO SUBSTITUTIONS"), provide the product indicated. No substitutions will be permitted.
2. Semi-Proprietary Specification Requirements: Where specifications name two (2) or more products or manufacturers, one product or manufacturer is indicated as the "Standard for Specification," while other products or manufacturers listed are considered to be equal. Provide one (1) of the products indicated. No substitutions will be permitted.
3. Descriptive Specification Requirements: Where specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with contract requirements:
4. Performance Specification Requirements: Where specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
5. Compliance with Standards, Codes, And Regulations: Where specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified..

2.2 PRODUCT SUBSTITUTIONS

- A. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. The specified product or method of construction cannot be provided within the contract time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution has received necessary approvals of authorities having jurisdiction.

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 is compatible with other portions of the Work.
 8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution has been coordinated with other portions of the Work.
 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 specified warranty.
 10. If requested substitution involves more than one Contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. The Contractor's submittal and Architect's acceptance of shop drawings, product data or samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.
1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the Work.
 - 3. Cutting and patching.
 - 4. Progress cleaning.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner

that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to

other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner promptly.
- B. Building Lines and Levels: Locate and lay out control lines and levels for construction, including those required for mechanical and electrical work. Transfer markings and elevations for use with control lines and levels.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with

other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
 - B. Site: Maintain Project site free of waste materials and debris.
 - C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 - D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
 - E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
 - F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
 - G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
 - H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
 - I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 - J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.7 PROTECTION OF INSTALLED CONSTRUCTION
- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
 - B. Comply with manufacturer's written instructions for temperature and relative humidity.
- 3.8 CORRECTION OF THE WORK
- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. In the Application for Payment, show 100 percent completion for the portion of the Work claimed as substantially complete.
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Complete final cleaning requirements, including touchup painting.
 - 12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection

or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures," with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 3. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 4. Submit consent of surety to final payment.
 5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion is delayed under circumstances acceptable to the Architect.
1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, reinspection will be repeated.

1.4 WARRANTIES

- A. Submit written warranties to the Architect prior to the date certified for tenant occupancy of the premises. If the Architect's certificate of Substantial Completion designates a Commencement date for warranties other than the date indicated, submit written warranties upon request of the Architect.
1. Commencement date for all warranties shall be the date of tenant occupancy of the premises
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

1. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting of special warranties.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

- E. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
 - 1. Where extra materials of value remain after completion of associated work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Product maintenance manuals.
 - 4. Systems and equipment maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Preliminary Procedures: Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.
- B. Final Submittal: Submit each manual in final form.

1.4 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.

- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Owner.
 - 7. Name and contact information for Architect.
 - 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm)

paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Include pocket folders for folded sheet information.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Wiring diagrams.
 6. Control diagrams.
 7. Piped system diagrams.
 8. Precautions against improper use.
 9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in procedures. Include a detailed review of the following items:
 - 1. Maintenance manuals.
 - 2. Spare parts and materials.
 - 3. Lubricants.
 - 4. Identification systems.
 - 5. Control sequences.
 - 6. Cleaning.
 - 7. Warranties and bonds.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
 - 1. Start-up.
 - 2. Shutdown.
 - 3. Emergency operations.
 - 4. Noise and vibration adjustments.
 - 5. Safety procedures.
 - 6. Economy and efficiency adjustments.
 - 7. Effective energy utilization
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.

1.2 SUBMITTALS

- A. Preliminary Procedures: Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.
 - 1. Record Drawings: Comply with the following:
 - a. Number of Copies: Submit one (1) set of marked-up Record Prints.
 - 2. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications.
 - 3. Record Product Data: Submit one (1) copy of each product data submittal.
 - a. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up product data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:

- a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Owner.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings.
- B. Format: Submit record Specifications to the Architect for the Owner's records.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal. Maintain one (1) copy of each product data submittal. Note related Change Orders and mark-up of Record Drawings and Specifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings.
- B. Record Sample Submittal: Immediately prior to substantial completion, Contractor shall meet Architect and Owner's personnel at the project site to determine which samples are to be transmitted to Owner for record purposes. Comply with delivery to Owner's sample storage area.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Owner's reference during normal working hours.

END OF SECTION 017839

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.2 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: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or storage.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.4 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 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Store items in a secure area until delivery to Owner.
 - 3. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 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.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.
 - 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.
- B. Burning: Do not burn demolished materials.

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 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:
 - 1. Floor slab where removed for installation of underground utilities, sanitary and electrical piping.
 - 2. Exterior concrete pads.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Material certificates.
- D. Material test reports.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
- B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI certified Concrete Flatwork Technician.
- C. ACI Publications: Comply with ACI 301, Specifications for Structural Concrete for Buildings, and ACI 318, Building Code Requirements for Reinforced Concrete, and CRSI Manual of Standard Practice unless otherwise indicated.
- D. Floor Flatness and Levelness Tolerances:
 - 1. Subfloors Under Materials Such as Concrete Toppings, Ceramic Tile, and Sand Bed Terrazzo: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 15, floor levelness (Fl) of 13.
 - 2. Subfloors Under Materials Such As Resilient Sheet Flooring, Vinyl Tile, Epoxy Toppings, Paint, and Carpet: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 20, floor levelness (Fl) of 17.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.2 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or Type II.
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded. 1-inch (25-mm) nominal maximum aggregate size.
- C. Water: ASTM C 94 drinkable and potable.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 25 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- D. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: not more than 4 inches.
 - 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

2.6 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

- A. Smooth-Rubbed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to vertical concrete surfaces exposed to public view.
 - 2. Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- B. 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. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING PADS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, and as otherwise indicated on drawings.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel support framing for equipment.
2. Stainless steel refrigerator closures.
3. Miscellaneous Steel angles and shapes.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Accessory materials used in conjunction with metal fabrications, including grouts and other items.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

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

1.3 QUALITY ASSURANCE

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. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- D. Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- E. Expansion Anchors: Steel anchor rods of length required for attachment of metal fabrications, designed to fasten into hollow masonry units, with epoxy-type adhesive; Hilti C-20 system, or approved equivalent.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- C. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

2.8 STAINLESS STEEL REFRIGERATOR CLOSURES

- A. Thickness: 0.050-inch thick
- B. Form stainless steel refrigerator closures to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well defined lines and arris.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- D. Finish: No. 4 finish (bright, directional polish).

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

- A. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- B. 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. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including anchor bolts, and miscellaneous items having integral anchors that are to be embedded in masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports securely to building.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.
4. Cribbing at freezer floor.

1.2 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NLGA: National Lumber Grades Authority.
 2. RIS: Redwood Inspection Service.
 3. SPIB: The Southern Pine Inspection Bureau.
 4. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
 - 1. Application: Exposed framing.
 - 2. Species and Grade: Southern pine; Select Structural grade; SPIB.
 - 3. Species and Grade: Spruce-pine-fir (south); Select Structural grade; NeLMA, WCLIB, or WWPA.

2.5 DIMENSION LUMBER FOR CRIBBING UNDER FREEZER UNITS

- 1. Species and Grade: Redwood, Construction Common Grade; RIS.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Bucks
 - 3. Nailers.
 - 4. Grounds.

- B. For blocking not used for attachment of other construction, Standard, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
 - 1. Maximum moisture content 19 percent for items not specified to receive wood preservative treatment. No. 2 boards per SPIB rules.

2.7 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.
 - 1. Trademark: Furnish backing panels that are each factory-marked with APA trademark evidencing compliance with grade requirements

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.
- G. Use steel common nails or screws, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- H. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. The use of wood blocking for support or anchorage of mechanical and electrical piping, equipment, devices, and other items will not be permitted, unless otherwise indicated

3.3 CONSTRUCTION PANEL INSTALLATION

- A. General: Comply with applicable recommendations contained in form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Plywood Backing Panels: Screw to supports with flat-head wood screws at 1' -0" o. c. each direction (max.).

END OF SECTION 061000

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets and countertops.
 - 2. Solid-surfacing-material countertops.
 - 3. Solid-surfacing-material wall caps.

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in architectural woodwork.
- C. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
 - 2. Solid-surfacing materials, 6 inches (150 mm) square.
 - 3. Decorative Cabinet Liner.
- D. Qualification Data: For Installer and Fabricator.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this project and whose products have a record of successful inservice performance, as well as sufficient production capacity to produce required units without delaying the work.

- B. Installer Qualifications: Arrange for interior 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.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI quality certification program labels or certificates indicating that woodwork complies with requirements of grades specified.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by ul, its, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
 - 1. Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for standard time period (10 minutes).
 - 2. Flame Spread: 75.
 - 3. Smoke Developed: 450

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Particleboard: ANSI A208.1, Grade 2-M-2. made with phenol-formaldehyde resins; minimum 45 lb. High Density.
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div. (Basis-of-Design).
 - c. Panolam Industries International Incorporated.
 - d. Wilsonart International; Div. of Premark International, Inc.
 - 2. Colors and Patterns: Match Architect's samples, unless indicated otherwise on drawings.
- D. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. E. I. du Pont de Nemours and Company (DuPont) (Basis-of-Design).
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Swan Corporation (The).
 - 2. Type: Standard type, unless Special Purpose type is indicated.
 - 3. Colors and Patterns: Match Architect's samples, unless indicated otherwise on drawings.
- E. Decorative Cabinet Liner: Decorative surface, minimum .020-inch thickness, white color. bonded to specified substrate.
 - 1. Substrate: Minimum 45 lb. density particleboard.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware"
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter. unless indicated otherwise on drawings
- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- E. Drawer Slides: BHMA A156.9, B05091.
 - 1. Grade 1; side mounted; full-extension type; zinc-plated steel slides with steel ball bearings, and rated for the following loads:
 - a. Box Drawer Slides: 75 lbf.
- F. Door Locks: BHMA A156.11, E07121.
- G. Drawer Locks: BHMA A156.11, E07041.
- H. Grommets for Cable Passage Through Countertops: molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide products by Doug Mockett & Company, Inc. unless indicated otherwise.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
 - 1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
- C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- F. Adhesive for Bonding Plastic Laminate: Contact cement.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.5 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.
- B. AWI Type of Cabinet Construction: Flush overlay.
 - 1. Core Material: Minimum 45 lb. density particleboard.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: GP-50, 0.050-inch nominal thickness, Grade HGS.
 - 2. Vertical Surfaces: GP-50, 0.050-inch nominal thickness, Grade HGS.
 - 3. Edges: GP-50, 0.050-inch nominal thickness, Grade HGS.
- D. Materials for semi-exposed surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Decorative cabinet liner, Grade VGS.
 - 2. Drawer Sides and Backs: Decorative cabinet liner, Grade VGS.
 - 3. Drawer Bottoms: Decorative cabinet liner, Grade VGS.

4. The use of melamine or other applied vinyl surfacing products on semi-exposed surfaces will not be permitted.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces indicated on drawings.

2.6 SOLID-SURFACING-MATERIAL COUNTERTOPS AND WALL CAPS

- A. Grade: Custom.
- B. Solid-Surfacing-Material Thickness: 3/4 inch (19 mm).
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 1. Edge Profile: Double Eased.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install solid-surfacing-material with fully adhered plywood or MDF backing panels.
 - 3. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 4. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 5. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- G. Wood Kick Rail on Base Cabinets: Install continuous wood kick rail at locations indicated, fastened to face of base cabinets with countersunk and filled fasteners. Install top of trim flush with laminate surface of openings in cabinet.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to Fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of substantial completion.
 - 1. Install 1/8-inch thickness cardboard on all countertops securely taped in place. General contractor ensure that no items are placed on countertops, or that no persons stand atop counter at any time.

END OF SECTION 064023

SECTION 072100 - INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber blanket sound control insulation.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

2.2 INSULATION FASTENERS

- A. Insulation Retainers: Steel wire retaining clips to hold batt insulation in place within metal stud partitions, type as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- E. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

- F. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Stuff glass-fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Preformed flashing sleeves.
3. Pipe Box assemblies.

1.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

1.4 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.
- C. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.
- D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
- G. Sealant: as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

2.3 ROOF CURBS AND PIPE BOX ASSEMBLIES

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom coordinated with roof construction indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Curbs Plus, Inc.
 - b. Pate Company (The).
 - c. Roof Products, Inc.
 - d. Thybar Corporation.
 - e. Vent Products Co., Inc.

- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch (1.32 mm thick).
 - 1. Finish: Mill phosphatized.
- D. Construction:
 - 1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
 - 2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 3. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 4. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.

2.4 PREFORMED FLASHING SLEEVES

- A. Pipe Sleeve and Vent Stack Flashing: Manufacturer's standard pre-fabricated pipe sleeve for single pipe penetration, with opening sized to accommodate pipe penetration required. Fabricate base of 0.063 inch thick aluminum sheet metal; minimum 8" base diameter and 8" height. Provide stainless steel snap-lock clamp for fastening pipe to sleeve.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Marco Industries
 - c. Thaler Metal USA Inc.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.
- E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes joint sealants for the following applications:
 - 1. Exterior joints in the following vertical surfaces:
 - a. Perimeter joints at frames of doors and windows.
 - b. Through wall pipe penetrations.
 - c. Isolation and contraction joints in cast-in-place concrete slabs.
 - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - b. Perimeter joints of casework and countertops.
 - c. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - d. Other joints as indicated.
 - 3. Interior joints in the following horizontal traffic surfaces:
 - a. Joints in cast-in-place concrete slabs.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
 - 1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- D. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved or licensed for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.5 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C)].
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the products listed in other Part 2 Articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants As selected by Architect from manufacturer's full range, or where sealant color is not indicated for application, match color of adjacent surface

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Single-component mildew-resistant silicone sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 786 Mildew Resistant.

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2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Either open-cell polyurethane foam or closed-cell polyethylene foam, as recommended by joint sealant manufacturer, for cold-applied sealants only.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

- approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Unglazed surfaces of ceramic tile.
 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - 4. Provide moisture-curing polyurethane sealant for sealing perimeter joints of exterior and interior door and window frames to adjacent surfaces, and for other joints as indicated.
 - 5. Provide silicone sealant for sealing perimeter joints of casework and toilet fixtures.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, acceptable to authorities having jurisdiction, for fire-protection

ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company. (Standard for Specification).
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, commercial steel (CS), Type B; with minimum A40 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Glazing: Comply with requirements in Division 08 Section "Glazing."
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 12.5 when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors.
 - 3. Vertical Edges for Single-Acting Doors: Square edge.
 - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 - 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (extra heavy duty), Model 2 (seamless). Minimum 0.0598 inch thick (16 gage).

- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (heavy duty), Model 2 (seamless). Minimum 0.0478 inch thick (18 gage).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets to comply with the following minimum sizes:
 - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 - 3. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
 - 2. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
 - 2. Frames for Level 2 Steel Doors: 0.0478-inch (18 gage) thick steel sheet.
 - 3. Frames for Wood Doors: 0.0478-inch (18 gage) thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames to comply with the following minimum sizes:
 - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 - 3. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

2.5 FRAME ANCHORS

- A. Supports and Anchors: Fabricated from metallic-coated steel sheet.
- B. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Masonry Type: Adjustable strap-and-stirrup or t-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10-inches long; or wire anchors not less than 0.177-inch-thick.
 3. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 4. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- C. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.042 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.042 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

- A. Plaster Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow metal doors:
 1. Exterior Doors: provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Plaster Guards: weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 4. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry and Post Installed Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 2) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.9 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual For Architectural And Metal Products" for recommendations for applying and designating finishes.
 1. Finish hollow metal door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPCSP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Prime Finish: Apply manufacturer's standard primer immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead-and chromate-free primer complying with ANSI/SDI A 250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).

- d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081216 - EXTRUDED ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-finished aluminum door and window frames for interior use.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Installer Qualifications: An experienced installer with a minimum five (5) years experience who has completed aluminum framing systems and door installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not begin installation of aluminum frames until area of work has been completely enclosed and interior is protected from the elements.
- B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling, and ventilation to maintain required environmental conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Frameworks Manufacturing.
 - 2. Custom Components Company.
 - 3. Versatrac Frames, a division of American Door Products, Inc.
 - 4. Western Integrated Materials, Inc. (Basis-of-Design)

2.2 MATERIALS

- A. Aluminum: Controlled alloy billets of 6063T5, to assure compliance with tight dimensional tolerances and maintain color uniformity.
- B. Steel: Galvanized.

2.3 EXTRUDED ALUMINUM FRAMES

- A. Western Integrated Materials, Inc., Series 300.
- B. Characteristics:
 - 1. Face Trim: 1 inch (302 snap on reveal trim)
 - 2. Throat size: As indicated on Drawings
 - a. 4-7/8 inches at 3-5/8" stud walls
 - b. 7-1/4 inches at 6" stud walls.
 - c. Adjustable for non-standard wall thicknesses.

2.4 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.5 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.
 3. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Door Frames: Reinforce as required to support loads imposed by door operation and for installing door hardware.
1. Provide manufacturer's standard silencers at stops to prevent metal-to-metal or metal-to-wood contact.
- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA611, AA-M12C22A21, 0.4 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that wall thickness does not exceed standard tolerance of plus or minus 1/16 inch.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with manufacturer's written instructions.

- D. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

END OF SECTION 081216

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with plastic-laminate faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate doors to be factory finished and finish requirements.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252, UL 10B or UL 10C.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door with removable tags or on bottom rail with opening number used on shop drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this article shall not deprive the owner of other rights the owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, installer, and contractor, in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - c. Failure to conform to tolerance limitations of referenced quality standards.
 - d. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries. (Basis of Design)
 - 3. Graham; an Assa Abloy Group company.
 - 4. Marshfield Door Systems, Inc.
 - 5. Mohawk Flush Doors, Inc.; a Masonite company.

6. Oshkosh Architectural Door Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch top-rail blocking, in doors indicated to have closers.
 - b. 5-inch bottom-rail blocking, in doors indicated to have kick, mop, or armor plates.
 - c. Provide doors with glued-wood-stave cores instead of particle board cores for doors indicated to receive exit devices.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

2.3 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns and Finishes: As indicated on the drawings.
4. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.
5. Core: Particleboard.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.4 LOUVERS AND LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Species compatible with door faces, stained to match plastic-laminate.
2. Profile: Flush rectangular beads or manufacturer's standard shape.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of matching material.
 - 2. Glazing: Job site installed glazing in doors indicated to be factory finished.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of substantial completion.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls.

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain access doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL MATERIALS

- A. Stainless-steel sheet, strip, plate, and flat bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
1. Finish: Directional satin finish, No.4.

2.2 ACCESS DOORS AND FRAMES FOR WALLS

- A. Basis-of-Design Product: The design for access doors and frames is based on the following:
 - 1. J. L. Industries, Inc.
- B. Subject to compliance with requirements, provide the above named product or comparable products by one of the following:
 - 1. Karp Associates, Inc.
 - 2. Larsen's Manufacturing Company.
 - 3. Milcor Inc.
- C. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- D. Flush access doors and frames with exposed trim: fabricated from stainless-steel sheet.
 - 1. Locations: Wall surfaces.
 - 2. Door: Minimum 0.0781-inch-thick sheet metal, set flush with exposed face flange of frame.
 - 3. Frame: Minimum 0.0625-inch-thick sheet metal with 3/4-inch-wide, surface-mounted trim.
 - 4. Hinges: Continuous piano.
 - 5. Lock: Cylinder.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame..
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Exterior and interior manual-swing entrance doors and door-frame units.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural Loads.
2. Thermal movements.
3. Movements of supporting structure indicated on drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: Provide aluminum entrance and storefront assemblies capable of withstanding wind pressures of 20 psf inward and 20 psf outward acting normal to the plane of the wall.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less when tested at positive and negative wind-load design pressures.

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly above to less than 1/8 inch and clearance between members and operable units doors to less than 1/16 inch when tested at 150 percent of positive and negative wind-load design pressures.
- E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- I. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average u-factor of not more than 0.65 btu/sq. ft. x h x deg f when tested according to AAMA 1503.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Elevations at 3/8-inch scale.
 2. Detail sections of typical composite members.
 3. Anchors and reinforcement.
 4. Hardware mounting heights.
 5. Provisions for expansion and contraction.
 6. Glazing details.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- 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. Product Test Reports: Certified test reports from a qualified independent testing laboratory showing that aluminum entrance and storefront systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.
- F. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- G. Warranties: Special warranties specified in this section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced Installer who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.
- C. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.
- D. Accessible Entrances: Comply with 2012 Texas Accessibility Standards (TAS), and local codes.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.

1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Air leakage.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components to function properly.
 2. Warranty Period: 3 years from date of Substantial Completion.
- B. The warranty shall not deprive the Owner of other rights or remedies the Owner may have under other provisions of the contract documents, and is in addition to and runs concurrent with other warranties made by the contractor under requirements of the contract documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for aluminum-framed systems is based on the following:
1. Kawneer Company, Inc. (Standard for Specification)
 - a. Trifab Versaglaze 450 System. 1-3/4" by 4-1/2".
- B. Subject to compliance with requirements, provide the above-named products or these comparable products by one of the following:
1. YKK AP America.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components. Where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.
- C. Fasteners and Accessories: Manufacturer's standard high-strength, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
 - 3. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use exposed fasteners with countersunk phillips screw heads, finished to match framing system.
- D. Concealed Flashing: 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- E. 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.
- F. 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.

2.4 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. 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.
 - 2. Formed Metal Fillers: Brake-formed fillers, fabricated from minimum .063-inch thickness aluminum sheet.

- B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical 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 mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.
 - 1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide square-type, snap-on extruded aluminum glazing stops, with exterior stops anchored for nonremoval.
 - 2. Design: Provide 1-3/4-inch-thick doors of design indicated.
 - a. Wide stile (5-inch nominal width).
 - b. Intermediate rails: manufacturer's standard 1-inch nominal width where indicated.

2.5 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."

2.6 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

2.7 ENTRANCE DOOR HARDWARE

- A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.
 - 1. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf ((133 N)) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- B. Refer to Section 08 71 00 -Door Hardware for requirements for hardware items other than those indicated to be provided by the aluminum entrance manufacturer.
- C. Scheduled Door Hardware: Provide door hardware according to the Door Hardware Schedule at the end of Part 3.
 - 1. Named Manufacturer's Products: Product designation and hardware manufacturer are listed in the Door Hardware Schedule at the end of Part 3 to establish minimum requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware.
 - a. Named products are basis-of-design products. Provide named hardware manufacturer's products or comparable products that are equivalent in function and quality and that are recommended and supplied by entrance system manufacturer.

- D. Continuous Hinges: Aluminum Continuous Geared Hinges, extending the full length of the door and frame. The two center gears form a rotating joint and the door weight is supported and cushioned by molded bearings evenly spaced along the entire length of the interlocking leaves.
 - 1. Finish: #17 Clear
- E. Combination Deadlock/Latch: Combination unit consisting of mortised maximum security deadlock, with minimum 1-inch-long pivoted bolt and stainless steel strike box and spring-loaded deadlatch bolt with lever handle release.
 - 1. Standard: ANSI A156.4, Grade 1.
- F. Cylinders: As specified in Division 08 Section "Door Hardware" for keying into the building system.
- G. Pull Handles: Aluminum pull handles of style indicated.
- H. Overhead Closers: Comply with manufacturer's recommendations for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.
 - 1. Standard: ANSI A156.4, Grade 1.
 - 2. Surface mounted, rack-and-pinion type, parallel arm, push side mounting.
- I. Thresholds: Extruded bronze thresholds of size and design indicated, beveled with a slope of not more than 1:2, with maximum height of 1/2 inch, in finish indicated, complete with anchors and clips.
- J. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- K. Overhead Concealed Stop: Heavy duty, non-handed with shock absorbing spring cushion.

2.8 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.9 FABRICATION

- A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.
 - 1. Thermal-Break Construction: Fabricate storefront framing system with an integrally concealed, low-conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's

standard construction that has been in use for similar projects for period of not less than 3 years.

- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the project site. Disassemble components only as necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 - 3. Preglaze door and frame units to greatest extent possible.
- C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
 - 1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
- D. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance, and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
 - 1. Uniformity of Metal Finish: Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submittal
- G. Fasteners: Conceal fasteners wherever possible.
- H. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
 - 1. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
 - 2. At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.>.
 - 3. At exterior doors, provide weather sweeps applied to door bottoms.

2.10 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual For Architectural And Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

- C. Exterior entrances and storefronts:
 - 1. Class I, Clear Anodic Finish: AA-M12C22A41 (mechanical finish: nonspecular as fabricated; chemical finish: etched, medium matte; anodic coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.5 CLEANING

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation, complying with requirements contained in Section 088000 Glazing, for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.6 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

3.7 ENTRANCE DOOR HARDWARE SETS

- A. General: Provide hardware for each door to comply with requirements of Division 08 Section "Door Hardware", hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.
- B. Door hardware

Set No 1: 100

2.0	Continuous Hinges	Kawneer	#17 Clear Anodized
2.0	Exit/Panic Device	Adams Rite G86	#14 Clear Anodized
2.0	Door Pull	Kawneer CO-9	#14 Clear Anodized
1.0	Mortise Deadlock Latch	Adams Rite MS+ 1890 X 4510	
2.0	Closer	Norton PR7500	689 Aluminum
1.0	Threshold	Pemko 2005 BV	
2.0	Concealed Overhead Stop	ABH 1000-SL	
Balance of Door Hardware by Door Hardware Supplier			

Set No 2: 101

2.0	Continuous Hinges	Kawneer	#17 Clear Anodized
2.0	Door Push Bar	Kawneer CPII	#14 Clear Anodized
2.0	Door Pull	Kawneer CO-9	#14 Clear Anodized
2.0	Closer	Norton PR7500	689 Aluminum
1.0	Threshold	Pemko 2005 BV	
2.0	Concealed Overhead Stop	ABH 1000-SL	
Balance of Door Hardware by Door Hardware Supplier			

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Submittals:

1. Door Hardware Schedule: Detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
 - 7) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of door hardware from a single manufacturer.

- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced Architectural Hardware Consultant (AHC) who is available to Owner, Architect, And Contractor, at reasonable times during the course of the work, for consultation.
 - 1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the work will not be delayed by hardware losses both before and after installation.

1.5 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.6 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Butts and hinges:
 - a. Hager Companies. (Standard for Specification)
 - b. Mckinney Products Company; An Assa Abloy Group Company.
 - c. Soss & Company.
 2. Cylinders and locks:
 - a. Corbin Russwin Architectural Hardware; An Assa Abloy Group Company. (Standard for Specification)
 - b. Sargent Manufacturing Company; An Assa Abloy Group Company.
 - c. Schlage Commercial Lock Division; An Ingersoll-Rand Company.
 3. Push bars and pull handles:
 - a. Rockwood Manufacturing Company. (Standard for Specification)
 - b. Hiawatha, Inc.
 - c. Trimco.
 4. Bolts:
 - a. Glynn-Johnson; An Ingersoll-Rand Company. (Standard for Specification)
 - b. Ives Hardware; An Ingersoll-Rand Company.
 5. Exit/panic devices:
 - a. Sargent Manufacturing Company; An Assa Abloy Group Company (Standard for Specification).
 - b. Dor-O-Matic; An Ingersoll-Rand Company.
 - c. Von Duprin; An Ingersoll-Rand Company.
 6. Overhead closers:
 - a. LCN Closers; An Ingersoll-Rand Company. (Standard for Specification)
 - b. Sargent Manufacturing Company; An Assa Abloy Group Company.
 - c. Norton Door Controls; An Assa Abloy Group Company.
 7. Mop/Protection Plates and Doorstops:
 - a. Rockwood Manufacturing Company. (Standard for Specification)
 - b. Ives Hardware; An Ingersoll-Rand Company.
 8. Door stripping and seals:
 - a. Pemko Manufacturing Co. (Standard for Specification)

- b. National Guard Products.
 - c. Zero International.
- 9. Thresholds:
 - a. Pemko Manufacturing Co. (Standard for Specification)
 - b. National Guard Products.
 - c. Zero International.
- 10. Astragals:
 - a. Pemko Manufacturing Co. (Standard for Specification)
 - b. National Guard Products.
 - c. Zero International.

2.2 SCHEDULED DOOR HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this section. Products are identified by using hardware designation numbers of the following:
 - 1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2.3 HINGES GENERAL

- A. Quantity: provide the following, unless otherwise indicated:
 - 1. Three Hinges: For doors with heights up to 90 inches.
 - 2. Hinge for every 30 inches of door height greater than 90 inches.
- B. Template Requirements: Provide only template-produced units.
- C. Hinge Options: As follows except where otherwise indicated in door hardware sets or on drawings:
 - 1. Hospital Tips: Slope ends of hinge barrel.
 - 2. Tips: Flat button and matching plug, finished to match leaves, except where Hospital Tip (HT) indicated. (standard for specification)
 - 3. Safety Stud: Designed for stud in one leaf to engage hole in opposing leaf.
 - 4. Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
 - 5. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors.
 - 6. Nonrising Pins: Provide for interior doors.

- D. Fasteners: comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Screws: Phillips Flat-head. Finish screw heads to match surface of hinges

2.4 LOCK CYLINDERS

- A. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- C. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Furnish permanent cores to Owner for installation.

2.5 KEYING

- A. Review keying system with Owner and provide required type (master, grandmaster, or great-grandmaster), either new or integrated with Owner's existing system.
- B. Keys: Nickel silver.
 - 1. Comply with Owner's instructions for masterkeying and provide individual change key for each lock.
 - 2. Coordinate masterkey system requirements with Construction Manager and Owner's masterkey schedule.
 - 3. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "Do Not Duplicate."
 - 4. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five

2.6 LOCKS AND LATCHES

- A. Accessibility requirements: comply with current edition of the Texas Accessibility Standards.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

- B. Lock throw: provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings, and as follows:
 - 1. Bored locks: minimum 1/2-inch (13-mm) latchbolt throw.
 - 2. Mortise locks: minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: minimum 1-inch (25-mm) bolt throw.
- C. Backset: 2-3/4 inches, unless otherwise indicated.
- D. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2.7 DOOR BOLTS

- A. Dustproof Strikes: Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
- B. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.
- C. Exit Device Dogging: Except on fire-rated doors where closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.

2.8 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with current edition of the Texas Accessibility Standards.
- B. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- C. Provide parallel arms for all overhead closers, unless otherwise indicated.

2.9 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:

1. Material: 0.050-inch-thick stainless steel

2.10 DOOR GASKETING

- A. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- C. Gasketing Materials: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semi-mortised, and of following metal, finish, and resilient bumper material:
 1. Extruded aluminum with natural anodized finish, 0.062-inch minimum thickness of main walls and flanges.
 2. Sponge neoprene conforming to MIL R 6130, Class II (closed cell).
 - a. Grade A (30 degrees F to 150 degrees F, oil-resistant and self-extinguishing).

2.11 THRESHOLDS

- A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.
- B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with current edition of the Texas Accessibility Standards.
 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
- C. Exterior Hinged Doors: Provide units not less than 4 inches wide, fabricated to accommodate door hardware and to fit door frames, and as follows:
 1. For out-swinging doors, provide saddle-type units compatible with sweep-seal-type weatherstripping installed on doors.

2.12 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine screws. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 - 1. Furnish screws for installation with each hardware item. Provide phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "Prepared For Paint" surfaces to receive painted finish.
 - 2. Concealed fasteners: for door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt or use sex screw fasteners.

2.13 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "No Lacquer."
- C. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets). 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.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise 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. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- D. Gasketing: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.

- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

- A. General: Provide hardware for each door to comply with requirements of this section, hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

SET NO. 1: 100

Qty.	Item	Manufacturer	Product	Finish
1	Cylinder	Corbin/Russwin	1080-114- A03-	626
2	Door Stop	Rockwood	480H x EXP	626

Balance of door hardware by Aluminum Storefront Supplier

SET NO. 2: 101

Qty.	Item	Manufacturer	Product	Finish
2.0	Door Stop	Rockwood	446	626

Balance of door hardware by Aluminum Storefront Supplier

SET NO. 3: 119, 120

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Door Push Plate	Rockwood	70C	626
1.0	Door Pull	Rockwood	111 x 70C	626
1.0	Closer	LCN	4011	AL
1.0	Wall Stop	Rockwood	407	626
1.0	Sign	Hager	368	Blue w/ White Letters
2.0	Mop Protection Plate	Rockwood	8"	626

Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 4: 115, 116, 117, 118

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Keypad Cylindrical Office	Schlage	AD-200 Standalone Electronic Lock	626
1.0	Closer	LCN	4111, parallel arm	AL
1.0	Wall Stop	Rockwood	407	626
1.0	Mop Protection Plate	Rockwood	8"	626
1.0	Coat Hook	Rockwood	802	626

Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 5: 102, 111

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Lever Handle Passage Set	Corbin/Ruswin	CL 3810 x NZD	626
1.0	Closer	LCN	4011	AL
2.0	Mop Protection Plate	Rockwood	8"	626
1.0	Wall Stop	Rockwood	407	626

Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 6: 103, 104, 105, 106, 107

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Lever Handle Passage Set	Corbin/Ruswin	CL 3810 x NZD	626
1.0	Removable Cylinder Core	Corbin/Ruswin	C6	626
1.0	Closer	LCN	4111, parallel arm	AL
1.0	Mop Protection Plate	Rockwood	8"	626

Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 7: 136

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Keypad Cylindrical Storeroom	Schlage	AD-200 Standalone Electronic Lock	626

1.0	Removable Cylinder Core	Corbin/Russwin	C6	626
1.0	Mop Protection Plate	Rockwood	8"	626
1.0	Wall Stop	Rockwood	407	626

SET NO. 8: 110, 112, 127

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Keypad Cylindrical Office	Schlage	AD-200 Standalone Electronic Lock	626
1.0	Removable Cylinder Core	Corbin/Russwin	C6	626
2.0	Mop Protection Plate	Rockwood	8"	626
1.0	Wall Stop	Rockwood	407	626

SET NO. 9: 130

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Keypad Cylindrical Storeroom Set	Schlage	AD-200 Standalone Electronic Lock	626
1.0	Removable Cylinder Core	Corbin/Russwin	C6	626
2.0	Mop Protection Plate	Rockwood	8"	626
1.0	Closer	LCN	4011	AL
1.0	Wall Stop	Rockwood	407	626
1.0	Set Weatherstrip	Pemko	319CR	
1.0	Door Sweep Seal	Pemko	57AV	

Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 10: 124, 125

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Door Push Plate	Rockwood	70C	626
1.0	Door Pull	Rockwood	111 x 70C	626
1.0	Closer	LCN	4011	AL
1.0	Floor Stop	Rockwood	446	626
1.0	Sign	Hager	368	Blue w/ White Letters

2.0	Mop Protection Plate	Rockwood	8"	626
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Provide Closer Arm Reinforcement by Aluminum Door Frame Manufacturer

SET NO. 11: 113B

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Panic Exit Device Lever and Knob Classroom	Corbin/Russwin	ED5400 w/ Surface Vertical Rods	626
1.0	Removable Cylinder Core	Corbin/Russwin	C6	626
1.0	Surface Closer	LCN	4111 HCUSH	AL
1.0	Threshold	Pemko	2005AV	
1.0	Gasketing	Pemko	319CR TKSP8	
1.0	Sweep	Pemko	57AV TKSP8	
1.0	Mop Protection Plate	Rockwood	8"x 2" less w.o.d.	626

SET NO. 12: 113A

Qty.	Item	Manufacturer	Product	Finish
3.0	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
2.0	Panic Exit Device Lever and Knob Classroom	Corbin/Russwin	ED5400 w/ Surface Vertical Rod (less bottom rod)	626
2.0	Mop Protection Plate	Rockwood	8"x 2" less w.o.d.	626
2.0	Closer	LCN	4111	AL

SET NO. 13: 132

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Lever Handle Passage Set	Corbin/Russwin	CL 3810 x NZD	626
1.0	Wall Stop	Rockwood	407	626

SET NO. 14: 123, 133, 134

Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 1/2"x4 1/2"	626
1.0	Lever Handle Storeroom Set	Corbin/Russwin	CL 3857 x NZD	626
1.0	Removable Cylinder Core	Corbin/Russwin	C6	626
1.0	Wall Stop	Rockwood	407	626

2.0	Mop Protection Plate	Rockwood	8"x 2" less w.o.d.	626
SET NO. 15: 121A, 129				
Qty.	Item	Manufacturer	Product	Finish
3.0	Pair Butt Hinges	Hager	BB1191 4 ½"x4 ½"	626
1.0	Lever Handle Entry Set	Corbin/Ruswin	CL 3851 x NZD	626
1.0	Removable Cylinder Core	Corbin/Ruswin	C6	626
1.0	Full Dummy Set (inactive leaf)	Corbin/Ruswin	CL 3850 x NZD	626
2.0	Mop Protection Plate	Rockwood	8"x 2" less w.o.d.	626
1.0	Closer	LCN	4111 (w/ hold open)	AL
1.0	Set Flushbolts (inactive leaf)	Ives	FB358	626
2.0	Floor Stop	Rockwood	443	626
SET NO. 16: 121B, 135				
Qty.	Item	Manufacturer	Product	Finish
3.0	Pair Butt Hinges	Hager	WTBB1191 4 ½" x 7" NRP	626
1.0	Lever Handle Storage Set	Corbin/Ruswin	CL 3857 x NZD	626
1.0	Removable Cylinder Core	Corbin/Ruswin	C6	626
1.0	Full Dummy Set (inactive leaf)	Corbin/Ruswin	CL 3870 x NZD	626
1.0	Threshold	Pemko	2005AV	
1.0	Flush Bolts (inactive leaf)	Ives	FB358	626
1.0	Astragal	Pemko	351_CV	AL
2.0	Closer	LCN	4111 (w/ hold open)	AL
1.0	Coordinator	Rockwood	576	
SET NO. 17: 122, 131				
Qty.	Item	Manufacturer	Product	Finish
1.5	Pair Butt Hinges	Hager	BB1191 4 ½" x 4 ½" NRP	626
1.0	Lever Handle Passage Set	Corbin/Ruswin	CL 3810 x NZD	626
1.0	Closer	LCN	4111, parallel arm	AL
2.0	Mop Protection Plate	Rockwood	8"	626

1.0	Wall Stop	Rockwood	407	626
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END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Storefront framing.
 - 4. Glazed entrances.
 - 5. Interior borrowed lites.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action. Load Duration: 60 seconds or less.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind

pressure to 1/50 times the short side length or 1 inch, whichever is less. For insulating Glass.

- c. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who has completed glazing similar in material, design, and extent to that indicated for this project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type; clear float glass and insulating glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: obtain glass test results for product test reports in "Submittals" article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this article shall not deprive Owner of other rights Owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by contractor under requirements of the contract documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS, GENERAL

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
 - 1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear).
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for condition a.
 - 3. Provide kind FT (fully tempered) float glass where indicated.
- C. Tempered Transparent Mirrored Glass:
 - 1. Basis of Design Product: Mirropane E.P.; Pilkington Building Products.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
 - 1. Neoprene complying with ASTM C 864.

- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
- C. Manufacturers: Subject to compliance with requirements, manufacturer's offering that may be incorporated into the work include, but are not limited to, the following:
 - 1. Preformed gaskets:
 - a. Advanced Elastomer Systems, L.P.
 - b. Schnee-Morehead, Inc.
 - c. Tremco, Inc.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. General:
 - 1. Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
 - 4. Colors of Exposed Glazing Sealants: Match existing window assemblies.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a shore, type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a shore, type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.6 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float Glass Units: Class 1 (clear) annealed float glass. Provide kind FT (fully tempered) clear float glass where indicated, or where required by codes or by authorities having jurisdiction over the project.
 - 1. Basis-of-Design Product: Pilkington-LOF glass (Standard for Specification), or a comparable product by one of the following:
 - a. Guardian.
 - b. PPG Industries.
 - 2. Thickness: 6.0 mm
 - 3. Match existing glass color, light transmittance and reflectance.
 - 4. Provide safety glazing labeling where applicable.
- B. Reflective Coated Vision Glass: grey tinted fully tempered float glass with pyrolytic coating.
 - 1. Basis-of-Design Product: Pilkington-Mirropane (Standard for Specification), or a comparable product by one of the following:
 - a. Guardian.
 - b. PPG Industries.
 - 2. Thickness: 6.0 mm

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Glazing channel dimensions, as indicated on drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: subject to compliance with requirements, provide products by one of the following:
1. Dietrich Industries, Inc. (Standard for Specification).
 2. Gold Bond Building Products Div., National Gypsum Co.
 3. Marino/Ware, Div., Ware Industries Inc.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 2. Maximum Deflection: 1/240 at 5 lbf per sq. ft. unless otherwise indicated
- B. Studs and Tracks: ASTM C 645, Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
1. Steel Studs and Tracks:
 - a. Minimum Base-Metal Thickness: 0.0359 inch (20 gage), unless indicated otherwise on Drawings or as required by performance requirements for horizontal deflection.

- b. Depth: 3-5/8 inches, unless indicated otherwise on Drawings.
 - 2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - a. Minimum Base-Metal Thickness: 0.0359 inch (20 gage), unless indicated otherwise on Drawings or as required by performance requirements for horizontal deflection.
 - b. Depth: 3-5/8 inches, unless indicated otherwise on Drawings.
 - 3. Protective Coating: Manufacturers standard corrosion-resistant coating equivalent G60 hot-dip galvanized coating per ASTM A 525.
- C. Slip-Type Head Joints: For full height partitions and where indicated, provide one of the following:
 - 1. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. ASTM A 653; with flange edges of track bent back 90 degrees to form 1 1/2-inch-wide minimum return leg, pre-attached slotted stud attachment clips, manufacturer's standard fasteners, and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1) Minimum Base-Metal Thickness: 0.0312 inch.
 - 2) Depth: 3-5/8 inches, unless otherwise indicated.
 - 3) Stud Spacing: 16 inches, unless otherwise indicated.
 - b. Products: Subject to compliance with requirements, provide the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) Steel Network Inc. (The); VertiTrack VTD Series.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Steel Thickness: 0.0329 inch (20 gage).
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

2.3 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with "Gypsum Construction Handbook" published by United States Gypsum Co.
- C. Install bracing at terminations in assemblies.

3.3 INSTALLING STEEL FRAMING FOR CEILINGS

- A. Install steel framing components in sizes and spacing indicated on drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Installation Tolerances: Install steel framing components for ceilings so that members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- C. Install steel studs for ceilings with ends bearing directly on framing members in adjacent partition construction.

1. Install cross bracing at the mid-point of each framing spans.
- D. 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.
- E. Fasten steel studs with suitable screw fasteners on bottom flanges directly to top runner of support partition.
- F. For exterior soffits, install cross-bracing and additional framing to resist wind uplift.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.
 1. Install steel studs 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:
 - a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
- C. Install additional steel studs in partition framing at intersecting walls, and partition corners.
- D. Slip-Type Head Joints: Where framing extends to overhead structural supports, install deflection tracks to produce joints at tops of framing systems that prevent axial loading of finished assemblies. Anchor tracks to deck with suitable fasteners located 2 inches from each end and spaced not more than 16 inches o.c. maximum.
 1. Attach webs of stud framing members to slotted connections on pre-attached clips of deflection track with manufacturer's standard fasteners. Do not fasten legs of studs to track legs.
- E. Install tracks (runners) at floors, overhead supports and where gypsum board stud assemblies abut other construction. Anchor runners with suitable fasteners located 2 inches from each end and spaced not more than 16 inches o.c. maximum. Continue framing around ducts that penetrate partitions above ceiling.
- F. Extend partition framing a minimum of 6-inches above height of suspended ceilings adjacent to partition. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings at same spacing as partition studs and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 1. Install diagonal stud bracing extending from the tops of the partitions to the underside of structural elements. Space the diagonal bracing not more than 2' -8" o. c., and fasten securely to the top of partition and bottom of structural element.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.

- b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame Openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

1.2 SUBMITTALS

- A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- B. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.4 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 weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

- D. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F. For finishing of gypsum board, maintain not less than 50 degrees F for 48 hours prior to application and continuously after until dry. Do not exceed 95 degrees F when using temporary heat sources.
- E. 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

2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Georgia-Pacific Gypsum LLC.
 - 2. Lafarge North America Inc.
 - 3. National Gypsum Company.
 - 4. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch (12.7 mm).
 - 2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Hot-dip galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass fiber mesh tape is not permitted.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.5 ACOUSTICAL SEALANT

- A. Acoustical Sealant For Concealed Joints: Manufacturer's standard nondrying, non-hardening, non-skinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical sealant for concealed joints.
 - a. Tremco Acoustical Sealant, Tremco, Inc. (Standard for Specification).
 - b. AC-20, Pecora Corp.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

- C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting hollow metal door frames.
- D. Thermal Insulation: As specified in Division 07 Section "Insulation."
- E. Vapor Retarder: As specified in Division 07 Section "Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install sound attenuation blankets where indicated prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install wall/partition panels in single panels, from floor to ceiling to eliminate horizontal end joints.
- E. Install 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 and 1/8 inch of open space at floors. Do not force into place.
- F. Locate edge and end joints over supports. 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 on opposite sides of partitions. Do not make joints at corners of framed openings.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Install gypsum panels at door and window frames or other openings in such a manner that **no vertical ends or joints occur within 6-inches of door or window frame or opening jamb.** End joints above such frames or openings shall be centered above the frame or opening.

- I. At full-height partitions up to roof deck, do not attach gypsum panels directly to legs of deflection track at top of wall.
- J. Spot grout hollow metal door frames. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- K. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4-to 3/8inch-(6.4-to 9.5-mm-) wide joints to install sealant.
- L. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4-to1/2-inch-(6.4-to12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- M. Attachment to steel framing: attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- N. Joints at corners of framed openings will not be permitted. No ends or joints within 6-inches of ends of wall, door or window openings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Moisture-And Mold-Resistant Type: At areas which are not to receive ceramic tile wall finish and where plumbing fixtures (sinks, water coolers, etc.) Are to be installed.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated. Use maximum-length panels to eliminate end joints.
 - a. Fasteners: Fasten gypsum panels with 1-1/4 inch long screws spaced 8 inches o.c. In field of panels and 8 inches o.c. At ends and edges.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and use maximum length panels to eliminate end joints. Horizontal application is not acceptable.
 - a. Fasteners: Fasten gypsum panels with 1-1/4 inch long screws spaced 8 inches o.c. In field of panels and 8 inches o.c. At ends and edges.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 3. L-Bead: Use where edge trims can only be installed after gypsum panels are installed.
 - 4. J-Bead: Use where edge trims abut storefront and at locations indicated on the drawings.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape. Mesh tape is not acceptable.
 - 1. Use of devices which simultaneously apply joint tape and embedding (first) coat of joint compound will not be permitted.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Tenant separation assemblies where surface appearance is not of primary importance as indicated on the drawings.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Where Level 1 Gypsum Board Finish is indicated, apply joint compound specified for embedding coat.
- F. Where Level 2 Gypsum Board Finish is indicated, all joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel, leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound.

- G. Where Level 4 Gypsum Board Finish is indicated, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combination:
1. Embedding (First) Coat: Ready-mixed, drying-type, all-purpose compound.
 2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose compound.
 3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose compound.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Crack isolation membrane.
3. Tile backing panels.
4. Glazed wall tile.

1.2 DEFINITIONS

- A. Module Size: Actual tile size plus joint width indicated.
- B. Face Size: Nominal tile size as defined in ANSI A137.1.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of tile and grout indicated, consisting of actual tiles or sections of tile, showing each type and finish of tile and grout indicated.
- C. Samples for Verification: For each type of tile accessory and trim moldings.
- D. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Cementitious backer units.

2. Crack isolation membrane.
 3. Joint sealants.
- D. Installer Qualifications: engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at 50 degrees F or more in tiled areas during installation and for seven (7) days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile, Trim Units and Grout: Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, and unless noted otherwise, provide the named product.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products indicated.

2.3 TILE PRODUCTS

- A. Floor Tile Type: Glazed floor tile.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
 - 2. Face: Pattern of design indicated, with square or cushion edges.
 - 3. Tile Color and Pattern: As indicated on the Drawings.
 - 4. Grout Color: As selected by Architect from manufacturer's full range, unless indicated otherwise on the drawings.
- B. Wall Tile Type: Glazed wall tile.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
 - 2. Face Size: As indicated on the drawings.
 - 3. Face: Plain with cushion edges.
 - 4. Tile Color and Pattern: As indicated on the Drawings.
 - 5. Grout Color: As selected by Architect from manufacturer's full range, unless indicated otherwise on the drawings.

2.4 CEMENTITIOUS TILE BACKER UNITS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C-Cure; C-Cure Board 990.
 - b. Custom Building Products; Wonderboard.
 - c. USG Corporation; DUROCK Cement Board.
 - 2. Thickness: 1/2 inch.
 - 3. Width: 48inches.
 - 4. 96-inches long minimum
- B. Mortar Unit Finishing Materials: Tape and joint compounds as recommended by manufacturer of cementitious backer units, and as follows:
 - 1. Joint Tape for Cementitious Backer Units: Polymer-coated, open glass-fiber mesh.
 - 2. Setting-Type Joint Compounds for Cementitious Backer Units: Factory-packaged, job-mixed, chemical-hardening powder products formulated for filling joints and treating fasteners of cementitious backer units behind ceramic tile.
 - a. Product: Subject to compliance with requirements, provide the following product:
 - 1) Durabond 90; United States Gypsum Co.
- C. Installation Accessories for Cementitious Backer Units:
 - 1. Fastening Adhesive for Metal: Special adhesive recommended for laminating cementitious backer units to steel framing.
 - 2. Drill Screws: Corrosion-resistant-coated steel drill screws of size and type recommended by board manufacturer for fastening cementitious backer units.

2.5 CRACK ISOLATION MEMBRANE FOR THIN-SET TILE INSTALLATIONS

- A. General: Manufacturer's proprietary load-bearing membrane material, fabricated with a self-adhering, pressure-sensitive formulation; capable of withstanding a horizontal movement of structural floor slab joint movement up to 3/8-inch.
- B. Product: Subject to compliance with requirements, provide the following.
 - 1. Products: National Applied Construction Products, Inc., ECB Anti-Fracture Membrane.
 - a. Material Width: Manufacturer's standard 36-inch wide rolls.
- C. Concrete Slab Primer: Manufacturer's standard water-based product recommended for application indicated.

2.6 SETTING AND GROUTING MATERIALS

- A. Mortar manufacturers:

1. TEC (Basis of Design)
 2. Bostik.
 3. C-Cure.
 4. Custom Building Products.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Prepackaged dry-mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water must be added at Project site.
 - a. Dry Polymer Additive: Manufacturer's standard.
- C. Grout manufacturer:
1. TEC (Basis of Design)
 2. Bostik.
 3. C-Cure.
 4. Custom Building Products.
- D. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated, consisting of the following:
1. Prepackaged dry-grout mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water must be added at Project site.
 - a. Dry Polymer Additive: Either polyvinyl acetate or ethylene vinyl acetate.
 2. Product: Subject to compliance with requirements, provide the following:
 - a. TEC (Basis of Design)
 - b. Custom Building Products; Polyblend Non-Sanded Grout.
 - c. C-Cure.
 - d. Bostik.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Dow Corning Corporation; Dow Corning 786.
- b. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
- c. Tremco, Inc.; Tremsil 600.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic, designed specifically for flooring applications.
- C. Metal Edge Strips: Coved and Bullnose-shaped, height to match tile and setting-bed thickness, metallic, designed specifically for inside and outside corner applications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 1. Drill tile where required at pipe penetrations. Tile cut into two pieces and installed with additional grout joint will not be permitted.
- F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both

directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

- G. Grout tile to comply with requirements of the following tile installation standards.
 - 1. For ceramic tile grouts (latex-portland cement grouts), comply with ANSI A108.10.
- H. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- I. Sealant: Apply continuous bead of silicone sealant at all inside corners of wall tile installation, and at all intersections of tile and other materials. Install sealant to comply with manufacturer's instructions.

3.4 CEMENTITIOUS TILE BACKER UNIT INSTALLATION

- A. General: Install cementitious backer unit substrate complying with ANSI A108.11 on all wall and ceiling surfaces indicated to receive thin-set ceramic tile finish.
- B. Cementitious Backer Units: Install cementitious backer units as follows:
 - 1. Walls: Install cementitious backer units horizontally, with long dimension perpendicular to wall studs, with ends located over studs. Fasten to studs with construction adhesive applied to the backs of the units at each end of unit at wall studs and at each intermediate wall stud. Fasten units to studs with screws at 6 inches on center. Provide
- C. Finishing of Cementitious Backer Units: Pre-fill open joints, rounded or beveled edges, and damaged areas with setting-type joint compound. Apply joint tape at joints of cementitious backer units (both directions). Apply setting-type joint compound over joint tape, fastener heads, penetrations, and elsewhere as required to prepare cementitious backer units to receive tile finish.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Crack-Suppression Membrane Underlayment: Install crack-suppression membrane underlayment at all control joint locations in concrete floor slab surfaces prior to setting floor tile, as follows.
 - 1. Primer: Apply manufacturer's standard water-based primer to all concrete floor slab surfaces to receive membrane underlayment, per manufacturer's recommendations.
 - 2. Membrane: Install crack-suppression membrane underlayment in continuous 36-inch wide strips. Center strips directly over control joint locations. At intersections of control joints, provide butt joints in membrane underlayment strips, per manufacturer's recommendations.

3.6 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements indicated below, including those referencing TCA installation methods and ANSI A108 series of tile installation standards:

1. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Concrete Subfloors, Interior: TCA F113.
 - b. Grout: Latex-portland cement.

3.7 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements indicated below, including those referencing TCA installation methods and ANSI setting-bed standards.
 1. Latex-Portland Cement Mortar: ANSI 108.5.
 - a. Cementitious Backer Units, Interior: TCA W244.
 - b. Grout: Latex-portland cement.

3.8 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- D. Research/Evaluation Reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical panel ceilings and components with the building code in effect for the project.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.
- B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the work.
- C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the work.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.6 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Basis-of-Design Product: subject to compliance with requirements, provide the following:
 - 1. Abuse-Resistant Acoustical Ceiling Panels:
 - a. Radar ClimaPlus; USG Interiors, Inc.
- C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: C (perforated, small holes).
 - 3. Color: White.
 - 4. LR: 0.84.
 - 5. NRC: 0.50 -0.60.
 - 6. CAC: 35 -39.
 - 7. Edge/Joint Detail: Square.
 - 8. Thickness: 5/8 inch.
 - 9. Modular size: 24 by 48 inches.

2.2 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. DX 26 system; USG Interiors, Inc.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653m, not less than G30 (Z90) coating designation, with prefinished 15/16-inchwide metal caps on flanges.
 1. Structural Classification: Heavy-duty system.
 2. End Condition of Cross Runners: Override (stepped) type.
 3. Face Design: Flat, flush.
 4. Cap Material: Steel cold-rolled sheet.
 5. Cap Finish: Painted white.

2.4 METAL EDGE MOLDINGS

- A. Roll-Formed, Sheet-Metal Edge Moldings: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

2.5 METAL EDGE TRIM

- A. Provide USG Compäso Standard metal edge moldings and trim: where indicated. The trim will feature smooth visible face with return edges. The non-visible face shall include flanges to accommodate Compäso Standard attachment clips that attach trim to adjacent ceiling grid. At vertical butt joints between adjacent trim pieces, utilize Compäso standard splice clips. Prefabricated corner pieces accommodate inwards and outwards 90 degree corners. Include diagonal bracing with L9 angle and attach to top clip slot with additional Compäso clip.
 1. Trim Height: 12" (305 mm).
 2. Trim Depth: 9/16" (14 mm).
 3. Trim Length: 10'-0" (3048 mm).
 4. Color: standard flat white 050.

2.6 ACOUSTICAL SEALANT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Tremco Acoustical Sealant; Tremco, Inc., (STANDARD FOR SPECIFICATION), or the following comparable product:
 1. BA-98; Pecora Corp.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
 4. Use manufacturer's standard attachment clip accessory to attach grid at perimeter.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Do not install products until they are at the same temperature as that of the space where they are to be installed.
- D. Install resilient products after other finishing operations, including painting, have been completed.
- E. Close spaces to traffic during installation of products specified in this Section.

1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base:
1. Manufacturers: Subject to compliance with requirements, provide products indicated on the drawings.
- B. Resilient Base Standard: ASTM F 1861.
1. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches, unless otherwise indicated.
- E. Lengths: Coils in manufacturer's standard length but not less than 100 feet.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors and Patterns: As selected by Architect from full range of industry colors unless otherwise indicated on the drawings.

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, provide products indicated on the drawings.
- B. Description: Reducer strip for resilient floor covering to concrete.
- C. Material: Rubber.
- D. Profile and Dimensions: As indicated.
- E. Colors and Patterns: As selected by Architect from full range of industry colors, unless indicated otherwise on the drawings.

2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates. Install wall base in single, continuous length for entire length of each wall surface, except where door frames, openings, built-in cabinets, or other in-place construction will not permit such installation. Splices in straight sections of wall base will not be accepted.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet vinyl floor coverings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Samples: For each type of floor covering indicated.
- C. Maintenance Data: To include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.5 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After post installation period, maintain temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor covering installation.

- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 SHEET VINYL FLOOR COVERING

- A. Products: Subject to compliance with requirements, provide products indicated on the drawings.
- B. Color and Pattern: As indicated on the Drawings.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer.
 - 1. Color: Match floor covering.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of floor coverings, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m).
- C. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install floor coverings until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- B. Lay out floor coverings as follows:
 1. Maintain uniformity of floor covering direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
 3. Match edges of floor coverings for color shading at seams.
 4. Avoid cross seams.
- C. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

- G. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
 - a. Do not wash floor coverings until after time period recommended by manufacturer.
- B. Protect floor coverings from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Cover floor coverings with undyed, untreated building paper until Substantial Completion.
 - 2. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096516

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Static Dissipative floor tile.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Full-size units of each color and pattern of floor tile required.
- C. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile before, during and after installation.

- B. Do not install tiles until they are at the same temperature as the space where they are to be installed.
- C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F.
- D. Close spaces to traffic during floor tile installation.
- E. Close spaces to traffic for 48 hours after floor tile installation.
- F. Install floor tile after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

- A. Deliver extra materials to owner. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE "SDT-1"

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Armstrong Static Dissipative Tile (Excelon SDT; Armstrong World Industries, Inc. (NO SUBSTITUTIONS).
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Manufacturer's standard factory finish.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As indicated on the drawings.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. For static dissipative tile use manufacturer's adhesive specially formulated for static dissipative tile.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.
 1. For static dissipative tile use manufacturer's polish specially formulated for static dissipative tile.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
 - 1. SDT must be installed as a system using the SDT tile, S-202 SDT Adhesive, copper grounding strips packaged with the adhesive, and S-392 SDT Polish.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
 - 2. Lay tiles in pattern with respect to location of colors and patterns as indicated on drawings.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Hand roll tiles per tile manufacturers recommendations.
- I. Remove and replace all tiles, which telegraph adhesive spreader marks, where open cracks occur between tiles, tiles are raised or puckered at joints, or any other surface imperfections occur in completed tile installation.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.

4. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
- C. Protect floor tile products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.
1. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of substantial completion in each area of project. Clean tiles using method recommended by manufacturer.
- E. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
1. Apply three coats to SDT.
 2. Use only the prescribed polish for SDT.
- F. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular, carpet tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified. Provide 12" square sample.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association or can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 and ASTM E 648 by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104 Section 5, "Storage and Handling."

1.7 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: **10** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.
- B. Fiber: "Eco solution q nylon".
- C. Pile Characteristic: Multi-level pattern cut/loop.
- D. Pile Thickness: 0.162 inches.
- E. Stitches: 11 per inch.
- F. Gage: 1/12 inch.
- G. Tufted Weight: 34 oz./sq. yd.
- H. Primary Backing/Backcoating: Manufacturer's standard synthetic materials.
- I. Secondary Backing: Manufacturer's proprietary material "ecoworx tile".
- J. Size: 24 by 24 inches.
- K. Applied Soil-Resistance Treatment: Manufacturer's standard material.
- L. Antimicrobial Treatment: Manufacturer's standard material.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- F. Installation Method: As recommended in writing by carpet tile manufacturer for direct glue-down installation.
- G. Maintain dye lot integrity. Do not mix dye lots in same area.
- H. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Install pattern parallel to walls and borders.
- L. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.

3. Vacuum carpet tile using commercial machine with face-beater element.
- M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Vinyl wall covering.
 - 2. Sealers and primers for preparation of wall surfaces to accommodate vinyl wall covering installation.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Samples for Verification: Full width by 36-inch- (1000-mm-) long section of wall covering from lot to be used for each type of wall covering indicated for each color, texture, and pattern required.
 - 1. Show complete pattern repeat.
- C. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by ul or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 15 or less.
 - b. Smoke-Developed Index: 25 or less.
- B. Installer Qualifications: Engage an Installer who specializes in the installation of vinyl wall coverings, with not less than three (3) years experience in installing wall coverings similar to those required for this work.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wall coverings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

- B. Maintain a constant temperature not less than 60 degrees F in installation areas for at least 10 days before and 10 days after installation.
- C. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- D. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- E. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.5 DELIVERY AND STORAGE

- A. General: Comply with instructions and recommendations of manufacturer and as specified herein.
- B. Inspection: Inspect wall covering material upon receipt from owner. Immediately notify Owner of any damaged material.
- C. Storage: Store materials in undamaged packages or containers. Do not store rolled goods in upright position. Maintain temperature in storage area above 40 degrees F.

1.6 EXTRA MATERIALS:

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to job site.
 - 1. Wall-Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Products: Subject to compliance with requirements, provide the product listed in Part 2 "Wall-Covering Products" article.

2.2 WALL-COVERING PRODUCTS:

- A. General: Provide rolls of each type of wall covering from same run number or dye lot.
- B. Quantity Requirements: Wall Covering Installer shall be responsible for calculating required quantity of wall covering material based upon installation requirements indicated. If initial order quantity is under calculated by the Installer, Installer shall be responsible for additional material cost, shipping charges, and replacement of previously installed initial wall covering material due to non-availability of initial material die lot.

- C. Vinyl wall covering:
 - 1. Products and Colors: As indicated on the Drawings.
 - 2. Vinyl Wall-covering Standards: Provide products complying with the following:
 - a. CFFA-W-101 for Type II, Medium-Duty products.
 - 3. Width: 54 inches.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, non-staining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer.
- B. Primer and Sealer:
 - 1. General: Use primers and sealers that are compatible with each specific wall covering and substrate.
 - 2. Primer: Latex-based primer, flat finish, tinted to match background color of wall covering material. Primer shall be compatible with wall covering material, sealer, and adhesive.
 - 3. Manufacturer's:
 - a. PPG. Zinsser, Shieldz Universal Wallcovering Primer
 - b. Sherwin Williams, Roman Primer PRO-999 RX-35.
 - 4. Sealer: As recommended by wall covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work. Notify Owner in writing of any conditions that are detrimental to the proper and timely completion of the work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt and dust.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Apply sealer in accordance with wall covering manufacturer's recommendations for each type of substrate.
 - 2. Apply primer to all wall surfaces that are to receive wall covering installation.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semi-gloss, and eggshell finish with fine sandpaper.

- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.
- B. Do not install any wall covering which has been crushed or damaged in any way, or which has surface imperfections.
- C. Install strips in same order as cut from roll.
- D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.
 - 1. Install wall covering in full widths as much as possible.
 - 2. Do not splice wall coverings above door frames or other openings. Splices made in this manner will not be accepted.
- F. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects with roller, brush, or broad knife.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.
 - 1. Do not cut wall covering while in place on drywall substrates. Use a special tool designed to raise the edge of wall covering and cut through the wall covering without cutting drywall substrate.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
- B. Surface preparation, priming, and finish coats specified in this section are in addition to shop-priming and surface treatment specified under other sections.
- C. Paint all exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
- D. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels:
 - 1. Pre-finished items not to be painted include the following factory-finished components:
 - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
 - a. Pre-manufactured canopies.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - d. Switchgear.
 - e. Distribution cabinets.
 - f. Furred areas.
 - g. Chases and shafts.
 - 3. Finished metal surfaces not to be painted include:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - 4. Operating parts not to be painted include moving parts of operating equipment, such as the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 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.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on drawings and in schedules.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications similar in material and extent to those indicated for the project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primer and undercoat paint produced by the same manufacturer as finish coats.
- C. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- D. Damage to Work of Other Trades: Painting Contractor shall be responsible for the protection of work performed and installed by others from damage due to paint application. Replacement of any work or materials which are damaged by painting operations will be the sole responsibility of the Painting Contractor.
- E. Liquidated Damages: Application of unspecified or unapproved paint products or deficiencies or deviations from the specifications herein will result in liquidated damages in the form of a penalty assessed upon the Painting Contractor equal to two hundred (200) percent of the value of the Contract for Painting Work.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Products not labeled with the information required above will be rejected by Owner.
- C. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide available products that may be incorporated into the work include, but are not limited to products listed in other Part 2 articles for the paint category indicated and as indicated on the drawings.
1. Benjamin Moore.
 2. PPG Paints.
 3. Sherwin Williams. (Basis of Design).

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- B. 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.
- C. Colors: As indicated on the drawings, otherwise as selected by Architect from manufacturer's full range of colors.

2.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain paints and coatings from single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. 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.
- D. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- E. Steel Substrates: Remove rust, loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
- H. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 1. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 2. Use only thinners approved by the paint manufacturer and only within recommended limits.
 3. Tint primers to match color of finish coats prior to application.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions
 1. Use applicators and techniques suited for paint and substrate indicated.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 1. Provide finish coats that are compatible with primers used.
 2. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 3. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 4. Apply additional finish coats to all sides, tops, and bottoms of doors until finish on such surfaces is equivalent to that of face surfaces.
 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 7. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Allow sufficient time between successive coats to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush or roller, according to the manufacturer's directions.
 - 1. Brushes: Use brushes best suited for the material applied.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 - 3. Use of spray-applicators for paint material application will not be permitted.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Re-coat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- G. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Two finish coats over primer.
 - a. Primer: Metal primer.
 - 1) Sherwin Williams: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White.
 - b. Intermediate Coat and Topcoat:
 - 1) Sherwin Williams: B53W01051 - Pro Industrial WB ALK Urethane Gloss Extra White/Color.
 - a) Color (P-X1): Match existing doors on existing building.
- B. Galvanized-Metal Substrates:
 - 1. Two finish coats over primer.
 - a. Primer: Galvanized metal primer.
 - 1) Sherwin Williams: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White.
 - b. Intermediate Coat and Topcoat:
 - 1) Sherwin Williams: B66W00611 - Pro Industrial High Performance Acrylic - Gloss Extra White/Color
 - a) Color (P-X2): Gray
- C. Concrete Masonry Units:
 - 1. Two finish coats over block filler.
 - a. Block Filler: Galvanized metal primer.
 - 1) Sherwin Williams: B25W00025 - PrepRite® Interior/Exterior Latex Block Filler White.
 - b. Intermediate Coat and Topcoat: Acrylic exterior flat.
 - 1) Sherwin Williams: C01W00251 - DuraCraft Exterior Acrylic Latex Flat Extra White/Color
 - a) Color (P-X3): Match existing wall on existing building.

END OF SECTION 09 91 13

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel.
 - 3. Gypsum board.
- B. Paint all exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
- C. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels:
 - 1. Pre-finished items not to be painted include the following factory-finished components:
 - a. Solid plastic toilet enclosures.
 - b. Acoustic materials.
 - c. Architectural woodwork and casework.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - f. Switchgear.
 - g. Distribution cabinets.
 - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
 - a. Furred areas.
 - b. Chases and shafts.
 - 3. Finished metal surfaces not to be painted include:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate
 - d. Copper
 - 4. Operating parts not to be painted include moving parts of operating equipment, such as the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- D. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primer and undercoat paint produced by the same manufacturer as finish coats.
- C. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- D. Damage to Work of Other Trades: Painting Contractor shall be responsible for the protection of work performed and installed by others from damage due to paint application. Replacement of any work or materials which are damaged by painting operations will be the sole responsibility of the Painting Contractor.
- E. Liquidated Damages: Application of unspecified or unapproved paint products or deficiencies or deviations from the specifications herein will result in liquidated damages in the form of a penalty assessed upon the Painting Contractor equal to two hundred (200) percent of the value of the Contract for Painting Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information. Products not labeled with the information required below will be rejected by Owner:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Paints.
 - 3. Sherwin-Williams Company (The). (Basis of Design).

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Material Quality:

1. 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.

C. Colors: As indicated on the drawings.

2.3 PRIMERS/SEALERS

A. Manufacturer's recommended factory-formulated primers that are compatible with the finish materials indicated. Tint all primers prior to application to match color of finish coats.

B. Subject to compliance with requirements, provide the following:

1. Gypsum Drywall Primer: Interior, latex primer:
 - a. PPG: Speedhide 6-4900 Zero VOC Latex Primer.

2.4 METAL PRIMERS

A. Manufacturer's recommended factory-formulated primers that are compatible with the finish materials indicated. Tint all primers prior to application to match color of finish coats.

B. Subject to compliance with requirements, provide the following:

1. Metal Primers, rust-inhibiting primer:

2.5 FINISH PAINTS

A. Manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

B. Subject to compliance with requirements, provide the following:

1. Walls, unless noted otherwise: Pre-catalyzed Acrylic Epoxy, Eg-Shell.
2. Walls, break room and toilet room: Pre-catalyzed Acrylic Epoxy, Semi-Gloss.
3. Ceilings: Interior Latex, Flat.
4. Concrete Floors: High Solids, Heavy Duty, Two-component, catalyzed polyimide epoxy.
5. Metal and Steel: Medium oil/alkyd All-Purpose Industrial Enamel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. 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.
- D. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions. If hardeners or sealants have been used to improve curing, use mechanical methods of surface preparation.

1. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
- F. Steel Substrates: Remove rust, loose mill scale, if any. Clean using methods recommended in writing by paint manufacturer, or use solvent or mechanical cleaning methods that comply with recommendations of the steel structures painting council (SSPC):
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- J. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by the paint manufacturer and only within recommended limits.
 4. Tint primers to match color of finish coats prior to application.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Apply paints and coatings by brush or roller, according to the manufacturer's directions.
 - 1. Brushes: Use brushes best suited for the material applied.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 - 3. Use of spray-applicators for paint material application will not be permitted.
- F. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacture.
- G. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Uninsulated metal piping.
 - b. Tanks that do not have factory-applied final finishes.
 - c. Items listed in other related Specifications which are required to be painted.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.
- B. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

- 1. High-Solids Epoxy Enamel Finish: Two finish coats over primer and topcoat:
 - a. Prime Coat: B58AQ0033 - ArmorSeal® 33 WB Epoxy Primer Sealer (Part A) Light Gray; B60VQ0033 - ArmorSeal® 33 WB Epoxy Primer Sealer (Part B) Hardener
 - b. Intermediate Coat: B58W00650 - ArmorSeal® 650 SL/RC Self-Leveling Epoxy (Part A) White Tinting Base; B60VQ0655 - ArmorSeal® 650 SL/RC Self-Leveling Epoxy (Part B) For 5 Gal Mix Standard Hardener
 - c. Finish Coats: B67W02001 - ArmorSeal® 1000 HS Epoxy (Part A) Extra White/Tint Base; B67V02002 - ArmorSeal® 1000 HS Epoxy (Part B) Hardener.

B. Steel Substrates:

- 1. Enamel Finish: One intermediate and one finish coat over primer:
 - a. Prime Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White.
 - b. Intermediate: B54W00101 - Industrial Enamel Gloss Alkyd Pure White/Color.
 - c. Finish Coat: B54W00101 - Industrial Enamel Gloss Alkyd Pure White/Color.

C. Galvanized-Metal Substrates:

- 1. Acrylic Epoxy over Waterborne Primer System:
 - a. Prime Coat: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White.
 - b. Intermediate Coat: K46W00151 - Pro Industrial PreCatalyzed Waterbased Semi-Gloss Epoxy Extra White/Color.
 - c. Topcoat: K46W00151 - Pro Industrial PreCatalyzed Waterbased Semi-Gloss Epoxy Extra White/Color

D. Gypsum Board Substrates:

- 1. Eggshell Acrylic Epoxy Finish: Two finish coats over primer:
 - a. Prime Coat: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White.
 - b. First and Second Coats: K45W00151 - Pro Industrial PreCatalyzed Waterbased Epoxy Eg-Shel Extra White/Color.

2. Semi-Gloss Acrylic Epoxy Finish: Two finish coats over primer:
 - a. Prime Coat: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White.
 - b. First and Second Finish Coats: K46W00151 - Pro Industrial PreCatalyzed Waterbased Semi-Gloss Epoxy Extra White/Color.
3. Flat Finish (On Ceilings): Two finish coats over primer:
 - a. Prime Coat: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White.
 - b. First and Second Finish Coats: B30W02651 - ProMar® 200 Zero VOC Interior Latex Flat Extra White/Color

END OF SECTION 099123

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes stainless-steel units as follows:
 - 1. Toilet compartment enclosures.
 - 2. Urinal screens.

1.2 SUBMITTALS

- A. Product Data: descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Show locations of cutouts for compartment-mounted toilet accessories.
- D. Samples for Verification: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment indicated.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Texas Accessibility Standards (TAS) for toilet compartments designated as accessible.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on shop drawings.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related items. Coordinate fabrication schedule and delivery with other work and with construction progress to avoid delaying the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 STAINLESS-STEEL UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Bradley Corporation, Mils Partitions.
 - 2. ASI Accurate Partitions Corporation.
- B. Toilet-Enclosure Style: Floor and ceiling anchored.
- C. Urinal-Screen Style: Wall hung flat panel.
- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
 - 1. Core Material: Manufacturer's plywood core in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
 - 2. Corner Reinforcement: Provide preformed stainless steel reinforcement.
 - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- E. Urinal-Screen Construction:
 - 1. Flat-Panel Urinal Screen: Matching panel construction.
- F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
 - 1. Pilasters: Manufacturer's standard thickness, but not less than 20 gauge.
 - 2. Panels: Manufacturer's standard thickness, but not less than 20 gauge.
 - 3. Doors: Manufacturer's standard thickness, but not less than 22 gauge.
 - 4. Flat-Panel Urinal Screens: Thickness matching the panels.
- G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 22 gauge nominal thickness and 4 inches high, finished to match hardware.

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

- 2.3 Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated, nonferrous, cast zinc alloy (ZAMAC).

- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match hardware, with theft-resistant-type heads. For concealed anchors, use hot-dip galvanized, or other rust-resistant, protective-coated steel.

2.5 FABRICATION

- A. General: Furnish standard doors, panels, screens, and pilasters fabricated for compartment system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

- B. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

- C. Doors: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's Standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
- B. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 102113

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Corner guards.
 2. Chair rails.
 3. Sanitary FRP protection panels.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
1. Installation methods for each type of substrate.
 2. Written data on each required component including physical characteristics, such as durability, resistance to fading, and flame resistance.
 3. Product test reports from a qualified independent testing laboratory showing compliance of wall surface protection system components with requirements indicated based on tests performed by the laboratory within the past five years.
- B. Shop Drawings: For each impact-resistant and sanitary wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on samples of size indicated below.
1. Corner Guards: 12 inches long.
 2. Chair rails: 12 inches long.
 3. Sanitary protection panels: 8 inches by 8 inches.
- D. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this project.

- B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this project and that have a record of successful in-service performance
- C. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.
- D. Impact Strength: Provide wall surface protection system components with a minimum impact resistance of 25.4 ft. lbs. per sq. ft. When tested in accordance with ASTM D 256 (Izod impact, ft. lbs. per inch notch).
- E. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.
- B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on shop drawings.

1.6 MAINTENANCE

- A. Maintenance Instructions: Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guard Covers and Chair Rails: Full-size plastic covers of maximum length equal to 5 percent of each type, color, and texture of units installed.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other part 2 Articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturer: Subject to compliance with requirements, provide products by the manufacturer specified.

2.2 MATERIALS

- A. Extruded Rigid Plastic: Engineered PETG: Extruded material should be high impact Acrovyn 4000 with shadowgrain texture, nominal .078" (1.98mm) thickness. Chemical and stain resistance should be per ASTM D543 standards as established by the manufacturer.
 - 1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
 - 2. Self-extinguishing when tested according to ASTM D 635.
 - 3. Flame-Spread Index: 25 or less.
 - 4. Smoke-Developed Index: 450 or less.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened.
- D. FRP (fiberglass reinforced plastic) panels: Produced in a continuous laminating process with random chopped fiberglass roving reinforcement and resin mix of polyester copolymer, inorganic fillers, pigments and catalysts.

2.3 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on vinyl/plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90-degree turn to match wall condition.

1. Manufacturers:
 - a. Construction Specialties, Inc.; Acrovyn 4000 Corner Guards, Model SSM-20AN.
2. Cover: Extruded rigid, impact-resistant, vinyl/acrylic plastic, minimum 0.078-inch wall thickness; in dimensions and profiles indicated on drawings.
 - a. Profile: Nominal 2-inch-long leg and 1/4-inch corner radius.
 - b. Length: As indicated on the drawings.
 - c. Color: As selected from manufacturer's full range of colors or as indicated on the drawings.
3. Retainer: Minimum 0.060-inch-thick minimum, 1-piece, extruded aluminum.
4. Top and Bottom Caps: Prefabricated, injection-molded plastic top and bottom caps; color matching cover; field adjustable for close alignment with snap-on cover.

2.4 CRASH RAILS

- A. Surface-Mounted, Resilient, Plastic Crash Rails: Assembly consisting of snap-on vinyl/plastic cover installed over continuous retainer; including mounting hardware; fabricated with integral shock absorbing cushions.
 1. Manufacturers:
 - a. Construction Specialties, Inc.; Acrovyn 4000 Crash Rails, Model SCR-48MN.
 2. Cover: Extruded rigid, impact-resistant, vinyl/acrylic plastic, minimum 0.078-inch wall thickness; in dimensions and locations indicated on drawings.
 - a. Profile: Nominal 6-inch-high.
 - b. Color: As selected from manufacturer's full range of colors or as indicated on the drawings.
 3. Retainer: Minimum 0.060-inch-thick, continuous extruded aluminum retainer strip attached to wall with #10 X 1 1/2" phillips pan head sheet metal screws with flat washer and AF-6 plastic anchors at 16" on center. Strip to contain a continuous cushion for added shock absorption.
 4. End Caps: Prefabricated, injection-molded plastic end caps; mechanically fastened with concealed fasteners; color matched; field adjustable for close alignment with snap-on cover.

2.5 SANITARY FRP PROTECTION PANELS

- A. FRP Wall Panels: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.
 1. Manufacturers:
 - a. Panolam Industries International, Inc.; Panolam FRP wall panels.
 2. Panels shall comply with the following:
 - a. Surface texture: Embossed.
 - b. Color: As selected from manufacturer's full range of colors or as indicated on the drawings.
 - c. Fire Rating ASTM E84: Class C.
 - d. Thickness: 0.090 inches.
 - e. Barcol Hardness ASTM D2538: 35.
 - f. Water Absorption ASTM D570: 0.2 percent.

- g. Accessories: Color matched dividers, outside corners, inside corners, end caps and fastening rivets.
- h. Adhesive: As recommended by manufacturer for specific application.

2.6 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 2. Notify Owner of conditions that are detrimental to proper and timely completion of installation.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on drawings.
 - 2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - 3. Where splices occur in horizontal runs, splice retainer and rail at different locations along the run.

4. Adjust installed end caps as necessary to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Custodial accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, provide products of the same manufacturer unless otherwise approved by architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 15 years from date of Substantial Completion.

- B. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, and of galvanized steel where concealed.
- G. Mirrors: Mirror glazing quality, clear-glass mirrors, nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality Q2, with silvering, electro-plated copper coating, and protective organic coating. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: The design for accessories is based on products indicated on the Drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. American Specialties, Inc.
 - 3. Bradley Corporation.

2.3 FABRICATION

- A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

- C. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:
 - 1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 PLUMBING WORK

- A. These Specifications are issued to cover all work in connection with the complete installation of the plumbing work. Plumbing work is hereby defined to include work as herein specified and as shown on the Drawings issued in connection with this project. Any reference in the Division 22 Specification Sections to the Contractor shall hereby be considered a reference to the Plumbing Contractor (Bid Package 20). Any reference or letting of work to subcontractors or manufacturers in these Specifications does not relieve the Contractor of his responsibility for the Work, materials, and equipment under this Contract. The Contractor is responsible for the work and performance of his subcontractors.
- B. The word "Building" used throughout these Specifications shall be interpreted to mean the entire building complex.
- C. The actual runs and locations of all piping, equipment, and materials shall be determined at the site and shall be installed to meet the various conditions at the building. It is, however, the Contractor's responsibility to predetermine the exact locations of piping and equipment, and to notify the other Contractors accordingly and prior to any installation to avoid conflict with other lines and equipment. Any changes necessary to conceal pipes or clear pipes and equipment of other trades shall be made without additional expense to the Owner.
- D. All work shall be executed and all equipment constructed and installed in accordance with the requirements of the State labor and industry and environmental protection codes, rules, and regulations, ASME, the Department of Labor, Safety and Health Regulations for Construction, OSHA, the National Fire Protection Association, the National Electrical Code as amended to date of bidding, and all applicable federal, state, county and local ordinances and regulations. Nothing contained in these Specifications or shown on the Drawings shall be construed to conflict with the aforesaid codes, ordinances, or regulations. Certificates of approval shall be obtained from any department issuing same, and shall be turned over to the Owner at the completion of the work. All fees and permits required shall be satisfied and obtained by the Contractor and the cost shall be included in the Contract price.
- E. The Contractor shall carefully examine the general building Drawings, all mechanical and electrical Drawings, and carry on his work so as not to delay or interfere with the work of other trades. He shall obtain in writing from the other Contractors such data as is necessary to coordinate his work with other branches. This coordination must take place prior to any piping

or equipment installation. As the work in the building nears completion, all threading, cutting, and similar work shall be done where directed by the Architect. Upon completion of the work, all remaining waste materials and rubbish resulting from the Contract work shall be removed from the building and premises.

- F. Where the phrase "or approved equivalent," "or equivalent," or "approved" appears in these Specifications, it shall refer to the approval of the Architect on the material or equipment involved.
- G. The term "Provide" means to furnish and install. The term "Furnish", used separately, means to obtain and deliver on the job for installation by other trades.
- H. Other Contractors will provide chases and openings in walls, floors, ceilings, and partitions of construction to receive pipe lines, risers, and other equipment insofar as it is possible to predetermine the exact location, but the Contractor shall install his work sufficiently in advance of the building construction to permit his work to be built into place. The Contractor shall advise the Construction Manager and other Contractors providing general construction work of the exact size and location of all chases and openings required for the installation of his work, and shall check size and location of all such chases and openings provided by the Contractors.
- I. The Contractor shall furnish and place all sleeves required for pipes passing through new floors, walls and ceilings before such general construction work is built into place. The Contractor shall place all inserts required for hangers and supports, as the construction work progresses, so that unnecessary cutting of construction work will be eliminated.
- J. The Contractor shall furnish and install all necessary structural steel members for the proper support of all piping and equipment furnished and installed under this Contract. All openings required through concrete or other construction for supports, piping, and equipment installed under this Contract shall be provided by the Contractor. No openings shall be made in the concrete or other construction without first securing the consent and approval of the Architect. All openings must be neatly drilled, bored or cut in a workmanlike manner, with materials and equipment suitable for the purpose. Punching or chipping of concrete or other construction will not be permitted. All openings shall be drilled, bored or cut in a manner satisfactory to and at locations approved by the Architect. Materials damaged shall be patched or replaced as directed by the Architect.
- K. Advance work as rapidly as possible to permit the plumbing system to be used when it is required for all areas of the building. Instruct the Operating Personnel as to the proper care and maintenance of all systems.
- L. Equipment and materials of similar types shall be of the same manufacturer unless specifically indicated otherwise on the Drawings or herein specified. The Contractor shall make final connections between all equipment furnished under this Contract and equipment furnished under other contracts except as otherwise specified herein.
- M. The materials used throughout shall be those of reputable manufacturers and shall be the best of their respective kinds. All equipment, components and materials shall be installed in a neat and workmanlike manner in accordance with best trade practices, manufacturer's recommendations, and applicable codes and standards and by persons skilled in each particular branch of the work assigned to them. All work shall be installed subject to the approval of the Architect.

- N. A complete list of materials proposed for each installation shall be submitted to the Architect for approval before delivery to the site. The Contractor shall submit samples of materials for approval at the site as requested by the Architect. Such materials may be incorporated into the structures after serving their purpose as samples.
- O. Where the Contractor elects to substitute approved materials or equipment for materials or equipment specified, he will be held responsible for all architectural, structural, mechanical, and electrical changes required for their installation at no additional cost to the Owner.
- P. The Contractor shall be entirely responsible for all apparatus, equipment and appurtenances furnished by him or his subcontractors in connection with the work, and special care shall be taken to protect all parts thereof in such manner as may be necessary or as may be directed. Protection shall include covers, crating, sheds, or other means to prevent dirt, grit, plaster, or other foreign substances from entering the working parts of machinery or equipment. Special care shall be taken to keep all open ends of pipes, etc., closed while in storage and during installation. Where equipment must be stored outside the building, it shall be totally covered and secured with heavy waterproof tarps and kept dry at all times. Where equipment has been subjected to moisture, it shall be suitably dried out before placed in service. Materials and equipment shall be stored in areas designated by the Architect.
- Q. Grades, elevations and locations shown on the Drawings are approximately correct; however, the Contractor shall field check and otherwise verify all such data at the site before proceeding with the work. The Contractor shall make necessary survey equipment available at all times and shall make use of such equipment wherever necessary to properly install his equipment.
- R. The Contractor shall visit the site and thoroughly acquaint himself with conditions existing at the site before submitting his proposal as he will be held responsible for the installation of the work complete in every detail. The Contractor shall especially review the Construction Manager's construction schedule and ensure compliance with this schedule.
- S. All work shown on the Drawings and not specifically included in the Specifications shall be considered a part of the Contract work. All work included in the Specifications and not specifically included on the Drawings shall also be considered a part of the Contract work.
- T. Carefully examine all Drawings and Specifications included under this Contract and Drawings and Specifications included under other contracts and report any discrepancies noticed to the Architect.
- U. Due to the small scale of the Drawings, it is not possible to indicate all offsets, fittings, valves, access panels, adapters, and similar parts which may be required. The Drawings are diagrammatic generally indicative of the work to be installed. The Contractor shall carefully investigate the structural and finish conditions affecting the work and arrange all work accordingly, furnishing necessary parts and equipment as may be required to meet the various conditions.
- V. The Contractor shall layout his work from dimensions of Architectural and Structural Drawings and actual dimensions of equipment being installed. Layouts in congested areas should not be scaled from plumbing, HVAC and Electrical Drawings. Clearances shall be provided on all sides of equipment as required for proper maintenance purposes and as required by State labor and industry rules and regulations.

- W. The Contractor shall furnish the services of manufacturers' representatives for all equipment furnished under these Contract documents. The amount of factory service provided by the Contractor shall be as normally recommended and furnished by the various equipment manufacturers unless specified otherwise. Testing of such systems and equipment shall be made under the direct supervision of competent authorized service representatives. Any and all expenses incurred by the equipment manufacturers' representatives shall be borne by the Contractor.
- X. All equipment and materials shall be manufactured in accordance with national standards established by manufacturer's associations, engineering and testing societies, such as NBMA, NEMA, ASTM, AMCA, ASME, ANSI, ACI, FM, U.L., where such standards have been established. The standards shall be construed to mean their correct Specifications and designations as amended, as of the date of bid opening.
- Y. When the installation is reported in writing by the Contractor to be complete and ready for acceptance, tests and inspection shall be made by the Contractor in the presence of the Architect to ascertain whether it complies with the Specifications and Contract, and upon its failure to do so, the Contractor shall at once remedy all defects and shortcomings and any additional tests that may be required shall be entirely at the Contractor's expense. All of the testing work shall be done when and as directed by the Architect before the system is accepted.
- Z. Include any excavation and backfill as required for work included under this Contract, as herein specified. Work shall conform to all applicable federal, state, county, and local regulations governing safety provisions at excavation sites.
- AA. Other Contractors will install insulation with vapor barrier in certain areas of the building. Where the building insulation or vapor barrier is broken due to the installation of piping and equipment, the Contractor shall properly repair all insulation and seal all openings with vapor barrier covering and vapor barrier adhesive, of types installed with the insulation.
- BB. The Architect reserves the right to revise locations of piping and equipment within the building, as long as sizes remain the same. The Contractor should include suitable allowance in his bid price for the above.
- CC. In all cases where equipment and materials are specified in the singular or plural number, it is intended that such reference shall apply to as many such items as are required to complete the installation.
- DD. Where piping or other equipment passes through fire or smoke barrier stops, walls, floors, or ceilings, this Contractor shall furnish and install sleeves and shall thoroughly seal openings around sleeves, pipes, and equipment with fire and smoke resistant materials. Materials shall be furnished by the Contractor as required to maintain the fire rating of the walls, partitions, ceilings and floors in accordance with the requirements of NFPA, State labor and industry rules and regulations, and other applicable codes.
- EE. All moving parts of equipment and appurtenances installed shall be properly lubricated by the Contractor.

1.3 RESPONSIBILITIES OF BIDDERS

- A. Before ordering any material or doing any work, this Contractor shall verify all measurements at the site and shall be responsible for the correctness of same. Any differences encountered between the site measurements and those shown on the Drawings shall be submitted to the Architect for consideration before proceeding with the work.
- B. This Contractor is assumed to be skilled in the trade and is solely responsible for compliance with health and safety regulations, performing the work in a safe and competent manner, and installation procedures required for the work as outlined in these documents.
- C. This Contract is all-inclusive of the work indicated on the Drawings and herein specified, and no separate Contract work, supplementary labor or service will be provided by the Owner, except as otherwise noted on the Drawings or herein specified.
- D. If any part of the installation specified or shown on the Drawings to be executed under this Contract requires a trade or classification of mechanics other than is normally directly employed by this Contractor, it shall be expressly understood that this Contractor shall sublet or engage mechanics experienced in each explicit trade involved to execute the work for the Contractor.

1.4 SCAFFOLDING AND RIGGING

- A. This Contractor shall provide all the scaffolding required to do the work included in this Contract. All necessary precautions must be taken in high risk areas. Provide temporary rigging, as required, to install new work.

1.5 DRAWINGS

- A. The drawings are intended to be diagrammatic and are based on one (1) manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions or all the details of the equipment. The Contractor shall verify the actual dimensions of any substituted materials and equipment to ensure that they will fit in the available space. All apparatus shall be located and all pipes run in the manner and locations shown thereon as closely as conditions will permit, and deviations therefrom shall be made only with the consent of the Architect and without additional charge.

1.6 FIVE-DAY PRIOR APPROVAL

- A. Any equipment or components proposed for this project, other than model numbers named in the bid documents, shall have pertinent submittal data and descriptive cover sheet submitted to the Architect five (5) days prior to the bid date for inclusion in an addendum, if and when, reviewed and accepted for bidding.
- B. This is for prebid review and is not to be regarded as submittals required for construction.
- C. Bidder shall base the bid on items of equipment actually named in bid documents or addendums issued prior to bidding. Verbal acceptance will not be recognized unless verified in writing. It is the Bidders' responsibility to ascertain that all equipment has been accepted by requiring copies of the Architect's written acceptance from the equipment suppliers.

1.7 STANDARD OF QUALITY

- A. All material shall be strictly in accordance with the quality, style and size as specified herein. Manufacturers' names and model numbers are given in the Specifications for the purpose of establishing a standard of quality, style, size and type, and shall not be construed to exclude equipment or material of other manufacturers.
- B. When the Contractor elects to substitute materials or equipment other than that specified, the Contractor will be held responsible for all architectural, structural, mechanical, and electrical changes required for the installation of substituted materials or equipment at no additional cost to the Owner. All changes shall be subject to architectural, mechanical, electrical and structural Architect's' complete approvals.
- C. When the Contractor desires to furnish equipment of another manufacturer, he shall include a complete specification of the substituted item with each submission copy of shop drawings indicating the necessary modifications to his standard product to satisfy the requirements of the Contract Specifications.
- D. Final approval of competitive equipment is reserved by the Architect, when in their opinion, the equipment does not correspond to that specified.

1.8 WARRANTIES

- A. The Contractor shall warrant that the materials and workmanship used in the erection of this installation are as herein specified, and he shall provide all labor and materials required to make good any defects in same which become apparent within one year from date of acceptance of beneficial, permanent use of completed work in writing, providing such defects are due to faulty materials or workmanship and not to misuse of apparatus by the Owner, its employees, or tenants. Certain equipment shall be warranted or guaranteed for longer than one year from date of final acceptance where specifically mentioned in these Specifications. This warranty shall be in writing and shall include written copies of factory warranties and expiration dates on items of equipment where the warranty date might differ from the acceptance date. No warranty shall start before the acceptance date. The acceptance will be for complete sections. No partial acceptance will be approved.
- B. The equipment and materials manufacturers are expected to recognize that they are responsible for the failure of their products to perform in accordance with data furnished by them or their authorized representatives as well as misrepresentations of such data. When the products have been installed in accordance with the manufacturer's published or written instructions and recommendations and such products fail, then the Contractor and the manufacturers are responsible for replacement of the products and all associated work and materials without additional cost to the Owner. This warranty applies to all items supplied on the equipment and not just those that are the product of the manufacturer.
- C. The Contractors' warranty shall include at least two (2) inspections of the system to repair and replace any items found to be defective during this period. The first shall be approximately six (6) months after the acceptance of the system and the second at the end of the first year.

1.9 REQUIRED SUBMITTALS

- A. Shop drawing submittals shall be clearly marked to show the intended item with identification as to unit number or other marking to show location, service, and function. Submittals not marked to identify the equipment and application will be rejected.
- B. Prior acceptance of equipment, per the shop drawing procedure as specified in these documents, is required before installing equipment. Any equipment installed without prior acceptance shall be subject to rejection, whether specified or not. All costs for the removal of rejected equipment and materials, and all costs for the replacement of such equipment and materials with approved equipment and materials shall be incurred by the Contractor without additional expense to the Owner.
- C. The equipment supplier, by submitting, certifies that the materials or equipment proposed is satisfactory for the application intended, including adverse conditions that may prevail at the job site, and that the materials and equipment are in current production with no known plans to cease production.
- D. The Contractor agrees that submittals processed by the Architect are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the Architect that the Contractor understands the design concept; and that this understanding is demonstrated by indicating which equipment and materials the Contractor intends to furnish and install and the fabrication and installation method that the Contractor intends to use.
- E. The Contractor further agrees that if deviations, discrepancies or conflicts between submittals, and Contract documents are discovered either prior to or after submittals are processed by the Architect; the Contract documents shall control and shall be followed.
- F. At the close of the job, prior to final review, two (2) bound indexed copies with hard back binders of the following for each system and associated equipment shall be submitted by transmittal to the Architect for review and acceptance. All brochures and formats must be approved by the Architect.
 - 1. Equipment warranties.
 - 2. Contractors' warranties.
 - 3. Parts list and manuals for all equipment.
 - 4. Operating instructions (in writing).
 - 5. Written instructions on preventative, routine, and breakdown maintenance, and care of the systems.
 - 6. Lubrication and recommended spare parts.
- G. The Contractor shall obtain two copies of a signed receipt from the Owner for the written instructions and equipment brochures. One copy of the receipt shall be delivered to the Architect, one copy to the Owner, and one copy shall be retained by the Contractor.

1.10 UTILITIES

- A. Do not interrupt any utility or service without adequate previous notice and schedule.
- B. The Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or services (underground, overground, interior or exterior) damaged, broken or otherwise rendered inoperative during the course of construction. The material used by the Contractor shall be approved by the Architect.
- C. Provide a 6" wide detectable metallic caution type foil marking strip for each exterior underground utility line installed under this Contract, continuously, all locations. Marking strip shall be a minimum of 12" below grade, color coded, with appropriate applicable wording. Marking strip shall be as manufactured by Seton Name Plate Company, Brady Co., MSI Services, or approved equivalent. Marking strip shall be placed before finished grading procedures and shall be directly coordinated with site utility marking strips provided by others.

1.11 AS-BUILT DRAWINGS

- A. Upon completion of this project, the Contractor shall furnish one (1) set of as-built Drawings of the complete installation of this project on mylar tracing paper. As-built Drawings, all of which shall be dimensioned, shall be to the scale of one-eighth (1/8") inch or one-fourth (1/4") inch being equivalent to one (1') foot to zero (0") inches. This project shall not be considered complete until as-built Drawings have been submitted and approved by the Architect.

1.12 INSTRUCTIONS TO OWNERS PERSONNEL

- A. The Contractor and his subcontractors shall satisfactorily complete the systems so that they are functional and operating to the satisfaction of the Architect. All systems, their controls and their sequencing must be demonstrated to the satisfaction of the Architect.
- B. The Contractor shall furnish the services of qualified personnel, approved by the Architect and thoroughly familiar with the completed installation to instruct the Owner's permanent operating personnel in the proper operation of all systems included under this Contract and the proper care of all equipment and apparatus. These services shall be furnished for a period of two 8- hour days after the operation of the building has been taken over by the Owner.
- C. When instructions are provided under this Contract, the Contractor shall have in his possession three copies of an identifying letter which shall list the names of the Contractor's qualified instruction personnel including manufacturer's representatives and subcontractors that will be giving instructions. Likewise on the same letter, spaces shall be provided for the Owner's personnel who will receive the instructions. After instructions have been given and received for each system, the Contractor's representatives and subcontractors shall sign and date the letter, and the Owner's personnel shall sign and date the letter acknowledging that they have received adequate instructions for operating and maintaining the systems and equipment. One signed copy shall be delivered Architect, and one copy shall be retained by the Contractor.
- D. It is the intent that the entire systems with their complement of equipment and auxiliary equipment operate properly in accordance with the design concept and functional intent. It is also the intent that the Owner be given complete instructions for the proper operation and maintenance of all systems.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All products shall be first-line quality, of grade and type shown on the Drawings, and specified or equivalents accepted by the Architect in writing.
- B. All products shall be in current production with no notice having been given that this product is to be drastically changed, modified or discontinued from production.
- C. The supplier, by submitting, certifies that the equipment being proposed is proper for the application intended and that it has the capacity called for on the Drawings or in the Specifications.

2.2 COMPLETE SYSTEM

- A. All products, materials, and accessories shall be furnished, and installed as required, for a complete system ready for the Owner's beneficial use.

2.3 EQUIPMENT AND MATERIALS DEVIATIONS

- A. When any material or equipment is identified on the Drawings or in the Specifications by reference to a manufacturer's name or model number; it is intended to establish a required standard of design and quality; and it is not intended to limit competition. It is understood that the phrase "Or Equivalent" is hereby inserted following a manufacturers' name, whether such a phrase occurs or not.
- B. When the Drawings and/or Specifications indicate one or more manufacturers' names for materials or equipment, the Bidder may submit a bid based on materials or equipment of manufacturers not named but considered by the Bidder to be equivalent to the standard of design and quality specified; however, such substitutions must be accepted by the Architect as equivalent. If the Bidder elects to bid on a substitution without securing written consent of the Architect prior to receipt of the bids, then it will be understood that proof of compliance with the specified requirements is the direct responsibility of the Bidder, and no such materials or equipment may be purchased or installed without written acceptance.
- C. Bidders are advised to ascertain such acceptance from their suppliers by requesting copies of acceptance in writing signed by the Architect from their suppliers.

2.4 ELECTRICAL WORK FOR PLUMBING EQUIPMENT

- A. Electric motors
 - 1. All electrical motors furnished and installed under this Contract shall be manufactured by Reliance, General Electric, U.S. Motors, or approved equivalent and shall be of the proper type and frame of the services involved in accordance with the NEMA and equipment manufacturer's recommendations. Motors shall be "energy efficiency" type with 1.15 service factor. Motor windings shall be all copper. Where possible, motors

shall be permanently lubricated. Where motors must be lubricated, the manufacturer shall furnish the services of a representative to review the lubrication procedure with the Contractor and the Owner and turn over to both of them all of the necessary maintenance literature. Motors and installation shall conform with all applicable requirements of the National Electrical Code. Motors shall be suitable for across-the-line or reduced voltage starting as applicable in each instance. Furnish the Electrical Contractor with all motor data to properly size overcurrent protection devices for all combination starters and disconnect switches. The Contractor shall be responsible for any additional costs to the Electrical Contractor (Bid Package 22) resulting from any changes in motor sizes initiated by the Contractor, from sizes scheduled on the Drawings. Motors located in conditioned space shall be selected for quiet operation and shall not produce an objectionable "Motor Noise" in the space.

B. Manual motor starters

1. Manual motor starters (disconnect switches/thermal overload switches) shall be furnished by the Contractor and installed by the Electrical Contractor (Bid Package 22), as indicated on the electrical Drawings. Furnish all motor electrical characteristics to the Electrical Contractor so the Electrical Contractor may size the manual starter (disconnect switches/thermal overload switches) overload devices.

C. Magnetic motor starters - full voltage

1. Furnish and deliver to the Electrical Contractor (Bid Package 22) for installation, combination full voltage magnetic starters and fused disconnect switches for all 3 phase motors with service factors of 1.15. Starters shall have three (3) current overload relays and low-voltage release. Starters shall be furnished with hand-off-automatic switch, red run light, overload reset, a set of extra auxiliary contacts consisting of one (1) normally open contact and one (1) normally closed contact and a control transformer with 120 volt fused secondary control circuit and fused primary circuit. Starter enclosure shall be NEMA Type 1 enclosures. Furnish Square D starters (No Substitutions). Disconnect switches shall be horsepower rated to match the horsepower of the motors plus 1.15 service factors connected thereto as required. Fuses will be furnished and installed by the electrical Contractor. See "Work Not Included", this section.
2. Where starters are separately mounted, they shall be of the magnetic type as herein specified.
3. All magnetic motor starters for motors connected to the normal/emergency electrical distribution system shall be furnished with an adjustable time delay unit. Time delay unit shall be capable of delaying motor starting from 0 to 180 seconds.

D. Hand-off automatic (H.O.A.) selector switches

1. Furnish and deliver to the Electrical Contractor (Bid Package 22) for installation, hand-off-automatic selector switches where shown or required and shall be the type that can be changed in the field from two positions and vice versa. Switches shall have padlocking attachment that will permit locking in either the manual or automatic positions. Switches shall be furnished with NEMA Type 1 enclosures where installed remote from starter. Furnish Square D three (3) position switches (No Substitutions).

E. Electrical characteristics shall be determined from the Drawings and verified on the job.

F. General

1. All power wiring by Electrical Contractor; all control wiring by the Contractor; refer to "Control Wiring", this section.
2. In general, rigid conduit or tubing for control wiring shall be used, but equipment that requires movement or that would transmit vibration to conduit shall be wired with flexible (liquid tight) steel conduit, not over eighteen (18") inches long.
3. All equipment with control wiring shall be grounded with a green-covered ground wire run inside the conduit and connected to the equipment frame on one (1) end and to grounding system on the other end.
4. All electrical work required in the Contract shall conform to all applicable requirements of Division 26 of these Specifications.
5. The Contractor shall employ an approved licensed subcontractor, fully qualified in the trade, to perform all electrical work required under the Contract.
6. This Contractor shall not run piping above motors, switchboards, or panelboards in accordance with the National Electrical Code. Before piping is installed, coordinate exact locations with the Electrical Contractor. Failure to comply with this requirement shall be cause for the piping to be removed and relocated at no additional cost to the Owner.

2.5 LABELING

- A. All electrical equipment and items consisting primarily of electrical components shall bear a label of an independent testing laboratory, such as Underwriters' Laboratory (UL).

2.6 CONTROL WIRING

- A. Furnish and install control wiring as indicated on the Drawings or as specified in various portions of the Specifications.
- B. All control wiring shall be extended in conduit. Use "Plenum Wire" without conduit where runs are in conditioned spaces such as relief and return plenums.
- C. Control wiring shall be run in conduit, and shall be copper conductors provided with Type THHN or dual rated THHN-THWN insulation and protective covering, not less than No. 12 AWG, run in accordance with the National Electrical Code; and in general, conforming to Division 26 Specifications for this project.
- D. Conduit above ground for control wiring shall be rigid steel conduit or electrical metallic tubing, run in accordance with the National Electrical Code; and in general, conforming to Division 26 Specifications for this project.

- E. Conduit below ground or below slab for control wiring shall be schedule 40 PVC, UL rated for 90 degrees C., run in accordance with the National Electrical Code; and, in general, conforming to Division 26 Specifications for this project.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work shall be performed by competent mechanics using proper tools and equipment to produce first-quality work. All work shall be neatly installed, accessible for maintenance, and complete with all accessories required.

3.2 ACCESSIBILITY

- A. All equipment shall be installed in such away that all components requiring access (control operators, motors, drives, belts, etc.) Are so located and installed that they may be serviced, reset, replaced or recalibrated, etc. By service people with normal service tools and equipment. If any equipment or components are shown in such a position that this Contractor cannot comply with the above, the Contractor shall notify the Architect.

3.3 WORK BY OTHER TRADES

- A. Cutting, patching, painting, electrical, plumbing, etc., shall be done by the affected trade at this Contractor's expense for changes required in work already installed or work required by other trades for changes made by this Contractor in type or size of equipment purchased.

3.4 WORK NOT INCLUDED

- A. All required openings in floors, walls and roof will be furnished by this Contractor. The Contractor shall coordinate the location and size of openings with the Construction Manager and other Contractors. This Contractor shall furnish all sleeves, frames, including framing between joists unless shown on the architectural or structural Drawings, access doors, and other accessories necessary for a complete installation. Only those items specifically shown and/or specified in other sections are excluded.
- B. Flashing of vent pipes and other penetrations in roof construction.
- C. Power and fuel for testing. See General and Special Conditions.
- D. Openings in exterior walls.
- E. Furring around piping.
- F. Final painting of interior surfaces.
- G. Recesses and openings in construction for plumbing piping and equipment.

- H. Electric power wiring to electrically operated plumbing equipment. All control and interlock wiring shall be by this Contractor.
- I. Magnetic motor starters and selector switches shall be furnished by this Contractor to the Electrical Contractor (Bid Package 22) for installation. Manual motor starters (disconnect switches/thermal overload switches) will be furnished and installed under the Electrical Contract, except where such items are factory installed as an integral part of the equipment. Coordinate all requirements with the Electrical Contractor.
- J. Fuses for the starter/disconnect switches shall be furnished by this Contractor and installed by the Electrical Contractor (Bid Package 22). The plumbing Contractor shall furnish the Electrical Contractor with all required motor data to properly size and select overloads and disconnect switch fuses in accordance with the national electrical code requirements. The Plumbing Contractor shall furnish to the Electrical Contractor the equipment manufacturer's circuit protection data to properly size overloads and fuses.
- K. Chases for piping where specifically shown on the Drawings.
- L. Extension of site water service, sanitary drainage, storm drainage, and gas service from this Contractor's terminal line locations (5 feet out from the exterior of the building) including final connections to these services.
- M. Gutters and downspouts.
- N. Humidifiers and air handling equipment. Final plumbing connections for this equipment are by this Contractor.
- O. Water meter will be furnished by the public works commission for installation by this Contractor, with all necessary costs included in the plumbing Contract.

3.5 FOUNDATIONS AND SPECIAL SUPPORTS

- A. Unless otherwise noted on the Drawings or in the Specifications, concrete bases for equipment shall be furnished and installed by this Contractor. The Contractor shall establish sizes and locations of the various bolts, together with the templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with suitable plate at bottom end of sleeve to hold the bolt. Each piece of equipment designated to have a base shall have a concrete base of not less than four (4") inches high, which shall project four (4") inches on all sides beyond the equipment. Bases shall have greater depths of height where so noted on the Drawings.

3.6 NOISE AND VIBRATION

- A. Furnish and install vibration isolators, flexible connectors, and other safety measures to prevent noise and vibration from being transmitted to occupied areas.
- B. Following installation, make proper adjustments to eliminate excessive noise and vibration.

3.7 CODES AND STANDARDS

- A. All material and workmanship shall comply with all applicable codes, federal and state laws, Specifications, local and county codes and ordinances, industry standards, utility company regulations, and NFPA. In case of a difference between codes, Specifications, federal and state laws, local and county codes and ordinances, industry standards, utility company regulations, NFPA, and the Contract documents, the most stringent shall govern. The Contractor shall promptly notify the Architect in writing of any such difference.
- B. Reference to the following codes shall mean:

<u>REFERENCE</u>	<u>DEFINITION</u>
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing Materials
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electric Manufacturers Association
ANSI	American National Standards Institute
NEC	National Electrical Code

- C. Should the Contractor perform any work that does not comply within the requirements of the applicable building codes, state laws and federal laws, local and county codes and ordinances, industry standards, utility company regulations, and NFPA, the Contractor shall bear all costs arising in correcting the deficiencies.
- D. This Contractor is assumed to be skilled in the trade and is solely responsible for compliance with OSHA regulations, performing the work in a safe and competent manner, and in installation procedures required for this work. All supervision assigned to this project shall be experienced in this type of work. This Contractor's superintendent shall be designated as safety inspector, unless the Contractor designates another person and notifies the Architect of this change.

3.8 PERMITS, TESTS AND INSPECTIONS

- A. The Contractor shall give all requisite notices, obtain and pay all deposits and fees, including connection fees, necessary for the installation, tests, and inspections of all work provided under this specification. All tests shall be conducted in the presence of the Architect.

3.9 REVIEW BY ARCHITECT

- A. This Contractor shall notify the Architect and Construction Manager at the following stages of construction so that the Architect and Construction Manager may visit the site for review and consultation:
 - 1. When equipment installation starts.
 - 2. When ceiling installation will cover any work not reviewed.

3. When any lines are to be permanently concealed by construction.
4. When any lines are to be permanently concealed by backfilling of trenches.
5. When testing is started.

- B. Should the Contractor fail to notify the Architect at the times prescribed above, it shall then be the Contractor's responsibility and cost to expose any concealed lines or demonstrate the acceptability of any part of the system. Any extra cost, caused by the removal of work by other trades, shall be borne by this Contractor, at no cost to the Owner.

3.10 EARLY START-UP

- A. This Contractor shall do all possible to see that the mechanical equipment is connected with electrical power as early as possible, so that final testing can be started. Should this Contractor be ready for operation and power is not available, the Construction Manager and the Architect shall be notified.

3.11 CLEANING AND PAINTING

- A. **Refer to Division 01 "Execution" for progress cleaning**
- B. At the completion of the project, thoroughly clean all new equipment and remove all trash, cartons, and similar debris from the area. Make any necessary corrections or repair/replace any damaged materials or equipment. Leave the entire systems in a thoroughly clean and orderly manner.
- C. Any finished surfaces that have been scratched or discolored shall be touched up or repainted with paint to match the original color. If any part has been bent, broken or otherwise damaged, it shall be replaced prior to final review.
- D. The Contractor shall prime coat and finish paint the following items of equipment and piping furnished. Painting shall be in strict accordance with the requirements and recommendations of OSHA.
1. All equipment and piping installed outside the building exposed to weather.
 2. All support steel, brackets, hangers, and other miscellaneous metals.
 3. All insulation covering on exposed piping and equipment.
 4. All uninsulated piping in mechanical equipment rooms.
- E. Surfaces required to be finished painted shall be painted as follows:
1. All uninsulated piping shall be painted with one (1) coat of rust inhibitive red primer and one (1) coat of gloss enamel.
 2. All other ferrous metals shall be painted with one (1) prime coat of equipment and machinery primer and one (1) finish coat of gloss enamel.

3. Coated cast iron or coated black steel piping need not be painted above ceilings; however, rusted or scraped piping shall be touched up, to keep a like new finish.
 4. All galvanized surfaces shall be painted with one (1) prime coat of galvanized steel primer and one (1) finish coat of gloss enamel. All aluminum surfaces shall be painted one (1) prime coat of aluminum primer and one (1) finish coat of gloss enamel.
 5. All other copper and brass surfaces shall be painted with one (1) prime coat of zinc chromate primer and one (1) finish coat of gloss enamel.
- F. Color code all natural gas piping per gas company requirements, including on roof.
- G. Paint shall be of colors selected by the Architect.
- H. Finish paint color samples shall be submitted to the Architect for approval.
- I. Paint shall be as manufactured by Rust-Oleum, Sherwin-Williams, Glidden, PPG, or approved equivalent.

3.12 EQUIPMENT IDENTIFICATION

- A. All major items of equipment shall have name and number stenciled on the equipment housing for ease of identification. Stencils shall be two (2") inches high.
- B. Such names and numbers for the specific items of equipment shall be keyed into the index of the catalog data.

3.13 PIPING IDENTIFICATION

- A. All pipes, exposed and concealed, covered and uncovered, shall be stenciled with the name of the service and provided in accordance with the pipe marking table and with an arrow indicating the direction of flow. Temperature of hot water lines shall also be included, as applicable.
- B. Stenciling shall be plain block letters, about one (1") inch high and shall be located near each branch connection, near each valve, on both sides where piping passes through a wall or floor, and at least every thirty (30') feet on straight runs of pipe. On smaller runs of pipe, markings shall be centered. Where pipes are adjacent to each other, markings shall be neatly lined up.
- C. All stenciling shall be located in such a manner as to be easily legible from the floor.
- D. In lieu of stenciling, snap-around pipe markers may be utilized, interior or exterior, Seton Nameplate Co. "Set Mark", or approved equivalent.
- E. Pipe marking identification and color coding shall comply with ANSI A13.1.
- F. Markings on dark colored pipes shall be white. Markings on light colored pipes shall be black.
- G. All markings shall be as made by Seton Nameplate Company, MSI Services, Brady Co., or approved equivalent.

H. Pipe marking table.

<u>SERVICE</u>	<u>MARKINGS</u>
Domestic Cold Water	C.W.
Domestic Hot Water Supply (& Temperature)	H.W. (& Temperature)
Condensate Drain	COND. DR.
Sanitary Drain	SAN
Storm Drain	STORM
Sanitary Vent	SAN VENT
Gas Line	GAS

3.14 VALVE IDENTIFICATION

- A. All valves on the project shall be tagged with a name tag.
- B. Valve tags shall be round 1-1/2" brass or aluminum tags with valve numbers stamped on the face, attached to the valve by means of a brass or aluminum "S" hook or chain. The numbers shall be prefixed "P" for plumbing and shall be keyed to the valve schedules. Gas valves shall also be tagged. Valve schedules shall note the number, the general location of the valve, the service, and the normal position of the valve (opened or closed). Refer to "Equipment Identification Labels" this section for labeling of access panels or ceiling tiles for equipment above ceilings.
- C. Furnish two (2) copies of each valve schedule, showing location of valves, equipment or service, and whether the valves should be normally opened or normally closed. Valve schedules shall be typewritten and shall be mounted in a metal frame with glass front, hung in main mechanical equipment room where directed by the Architect.
- D. Numbers and tags shall be coordinated with those being installed under the HVAC Contract.

3.15 LEAD-FREE INSTALLATIONS

- A. The Contractor shall certify that all materials used in the construction of the plumbing systems are lead free. This certification shall apply to all plumbing used for drinking water. The certification form shall be obtained from the public works commission serving the building, by the Contractor.
- B. To be considered "Lead Free", solder and flux must not contain more than 0.2% lead. Pipe, fittings, and fixtures must not contain more than 8% lead.
- C. Water service will not be provided by the public works commission for building use until the plumbing system has been certified in compliance with these regulations.

3.16 FINAL CONNECTIONS

- A. All equipment noted as furnished and installed by other Contractors or by the Owner, that requires plumbing services, will be furnished and installed complete with trim by that party,

except as herein specified. The Contractor shall coordinate type and location of equipment, rough-in services noted or required and make final connections. Final connections shall include items such as drain tailpieces, "P"-traps, running traps, water shut-off stops, gas shutoffs, piping extensions, piping adapters, and like items.

- B. Make final plumbing connections to HVAC equipment.

3.17 EQUIPMENT IDENTIFICATION LABELS

- A. Where valves, cleanouts, etc., are located above removable tile ceilings or above access panels, the Contractor shall furnish and install identification labels on the corners of access panels or removable ceiling tiles. Labels shall be provided with the word "Valves," "Cleanout", and similar designations, so that the equipment may be readily located in the future.
- B. Identification labels shall not exceed 3" in length and 1" in height. Black letters shall be 1/4" high on white background. Labels shall be manufactured of engraved micarta or bakelite with pressure-sensitive backing and shall be nonabsorbent, nonporous and colorfast. Adhesive backing shall be chemically compounded to hold tight and fast at wide temperature extremes. Labels shall be as manufactured by Seton Name Plate Company, Brady Co., MSI Services, or approved equivalent. Labels shall be additionally secured with screws or rivets if necessary. Flexible plastic punched tapes will not be acceptable. Labels shall be coordinated with those being installed under other contracts.
- C. All major pieces of plumbing equipment shall include, at a suitable and accessible observation point on the equipment, a manufacturer's stamped brass or aluminum identification plate, with all pertinent capacity data stamped on the plate. Identification plate shall include all specific data, such as model number, serial number, motor data, horsepower, capacities, sizes, amperes, power consumption, speed, flows in gpm, temperatures, working pressures, operating pressures, and similar factors as applicable. In addition, pumps shall include total head in feet and impeller sizes.
- D. The Contractor shall be responsible for furnishing and attaching an identification plate for the above mentioned major equipment if not provided by the equipment manufacturer.
- E. Equipment marking tags shall be engraved phenolic, 1/16" thick, four edges binded, black with white lettering. The tag shall be securely mounted to the equipment. Tags shall provide such information as: "Water Heater – WH-1", etc., and include "Date of Installation and Project Number."
- F. The installations will not be considered acceptable unless identification plates and nameplates are attached.

3.18 MAINTENANCE

- A. Contractor shall be responsible for maintenance of all equipment and apparatus included under this Contract until final project completion.

3.19 PLUMBING PLANS

- A. The plumbing plans are intended to be diagrammatic and are based on one (1) manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions, or all the details of the equipment. The Contractor shall verify the actual dimensions of any specified or substituted materials and equipment to ensure that they will fit in the available space. All apparatus shall be located as closely as conditions will permit and deviations therefrom shall be made only with the consent of the Architect and without additional charge to the Owner. The right is reserved by the Architect to make any reasonable changes in the location of the equipment prior to rough-in without invoking additional expense to the Owner.

3.20 QUALITY CONTROL TESTING

- A. Refer to Architectural Divisions.

3.21 QUALITY ASSURANCE TESTING

- A. Refer to Architectural Divisions.

3.22 CUTTING AND PATCHING

- A. All openings or chases required for the installation of the work in the building will be provided by this Contractor.
- B. This Contractor shall set all sleeves, hangers and anchors required for his work and shall be responsible for their proper and permanent location.
- C. This Contractor shall seal all openings he has utilized in fire rated floors, ceilings or partitions after his work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material.

END OF SECTION 22 05 00

SECTION 22 05 05 – BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 CODE COMPLIANCE

- A. All plumbing work and materials shall comply with all applicable codes. Energy conservation shall be provided for plumbing systems as described in applicable State building energy conservation acts.

1.3 ROUGH-IN

- A. This Contractor shall verify roughing-in dimensions for all fixtures and equipment prior to his roughing-in for such fixtures and equipment.

1.4 SCOPE OF WORK

- A. The work to be performed under these Specifications shall include providing all labor, materials, and equipment necessary to furnish and install, complete, properly, and fully all plumbing work as shown on the Drawings or herein specified. It is the intent of these Specifications that a complete and operating system shall be installed and this Contractor shall carefully examine the site, plans, and Specifications, and shall include all items necessary to accomplish this purpose. The work, in general, shall include, but shall not be limited to the following:
 - 1. Provide sanitary drainage systems as indicated. Extend sanitary sewers 5'-0" outside of exterior walls, for extension under the site contract. Final connections by Sitework Contractor (Bid Package 1). Provide floor drains.
 - 2. Roof drainage is provided by downspouts to grade. Downspouts to be furnished and installed by the other contractors with final connections and extension to storm drainage system installed under the Sitework Contract (Bid Package 1).
 - 3. Provide water service, arranged as detailed. Extend water service 5'-0" outside of exterior wall, for extension under the Sitework Contract (Bid Package 1). Final connections by Sitework Contractor (Bid Package 1).
 - 4. Provide complete domestic hot and cold water distribution systems. Install water metering equipment.

5. Provide a natural gas service, arranged as detailed. Work natural gas service to 5'0" outside of exterior wall, for extension under the Sitework Contract (Bid Package 1). Final connections by Sitework Contractor.
6. Provide plumbing services and final connections for equipment furnished under various contracts or by the Owner.
7. Provide insulation for piping and equipment as specified.
8. Provide wall hydrants and hose bibbs.
9. Testing, adjusting and balancing all plumbing piping and equipment.
10. Provide plumbing fixtures and trim.
11. Provide gas-fired domestic hot water heater.

PART 2 - PRODUCTS

- 2.1 THIS PART IS NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS

- A. Shop drawing submittals shall not be regarded as installation manuals. It is the responsibility of the Contractor to obtain installation recommendations from the manufacturer of each item of the equipment.
- B. This Contractor shall submit prints of shop drawings and manufacturers' data and manufacturer's data for approval in the manner prescribed. Include in this submission for the following items. Additional items may be required at the Architect's discretion.
 1. Hangers, supports, inserts, flexible connectors, and pipe sleeves.
 2. Plumbing fixtures and trim.
 3. Valves, thermometers, pressure gauges, strainers, relief valves, air vents, mechanical pipe couplings, pressure reducing valves, water hammer arrestors.
 4. Location and size of sleeves for openings in floors and walls; escutcheons.
 5. Thermal insulation.
 6. Valve tags and lists, stenciling materials.
 7. Access panels.

8. Identification labels.
9. Fireproofing materials.
10. Paint.
11. Piping.
12. Drainage specialties; trap primers.
13. Backflow prevention devices.
14. Wall hydrants and hose bibbs.
15. All pumps and controls.
16. Domestic water heating equipment.
17. Heater expansion tank.

END OF SECTION 22 05 05

SECTION 22 05 05.10 – PLUMBING TESTS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE OF WORK

- A. This Contractor shall make all preliminary and final tests at the site on piping systems included under this contract, on the storm and sanitary drainage systems, rain water collection system piping, gas piping, cold water and hot water piping. Contractor shall provide all testing instruments, pumps, smoke machines, gauges and other equipment for all tests, and the services of competent mechanics for conducting the same. Contractor shall also pay all fees required by the local authorities in connection with such tests. All tests shall conform with the requirements of the prevailing local plumbing codes.

PART 2 - PRODUCTS

- 2.1 THIS PART IS NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION

3.1 PROCEDURES

- A. All tests shall be made in the presence of a representative of the Architect, and in the presence of representatives of the local authorities having jurisdiction, and insurance authorities, whose presence is required. This Contractor shall notify the Architect and all authorities at least 48 hours in advance of such tests. Preliminary tests shall be made before giving such notification.
- B. All systems shall be left in good operating condition. If defects of material or workmanship in piping systems or equipment are disclosed as a result of these tests and operations, repairs shall be made by this Contractor, using new materials; and all defective materials shall be removed from the site immediately. Tests shall be repeated until a satisfactory test has been made.
- C. No caulking of screwed joints, cracks or holes will be acceptable. Replacing shall be the full length of defective sections of pipe. Defective apparatus shall be removed from the site and replaced by apparatus conforming to the requirements of these Specifications. The entire cost of repairs shall be borne by this Contractor.

3.2 DRAINAGE SYSTEM TESTS

- A. Tests of the sanitary and storm piping systems within the building shall be made with water. Upon completion of the piping, all openings in the system shall be closed, and the systems completely filled with water to the top of the highest stack. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test; and each section shall be filled with water, but no section shall be tested with less than a ten (10') foot head of water.
- B. The next proceeding section, shall be tested so that no joint or pipe in the building (except the uppermost ten (10') feet of the system) shall have been submitted to a test of less than a ten (10') foot head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before inspection starts; the system shall then be tight at all points. All exterior sewers included under this contract shall be tested in accordance with local sewer authorities having jurisdiction.

3.3 DOMESTIC WATER PIPING

- A. All water distribution piping, interior and exterior, included under this Contract, shall be hydrostatically tested to a pressure one and one-half times the normal system pressure or 150 psi, whichever is greater, and maintained for a period of 2 hours with a pressure loss of not more than 5 psi. The exterior water distribution system shall be tested in compliance with the public works commission. Confirm requirements prior to bidding.

3.4 PLUMBING FIXTURES

- A. The operation of all plumbing fixtures after installation and connection shall be tested to the satisfaction of the Architect.

3.5 GAS PIPING

- A. Test gas piping included under this contract in strict accordance with gas company requirements.

3.6 EQUIPMENT

- A. All new equipment shall have an 8 hour operating test, during which time the Contractor shall demonstrate to the satisfaction of the Architect that the equipment is working properly and that all controls and safety devices are functioning properly.

END OF SECTION 22 05 05.10

SECTION 22 05 10 – PLUMBING BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE OF WORK

- A. Scope of the work shall include the furnishing and complete installation of the equipment covered by this section with all auxiliaries, ready for Owner's use.

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS, VALVES, AND ACCESSORIES

- A. Materials for fittings shall match the piping system category for pressure, temperature, and corrosion.

2.2 PIPE JOINT MATERIALS

- A. Screwed pipe joints shall be made up using Teflon tape, Rectorseal No. 5 Pipe Dope, or other lubricants, as approved for the particular installation.
- B. Soldered joints shall be made up with Paste Flux and Bridgit Lead-Free, Silvabrite 100, or silver solder, or equivalent.

2.3 PIPE SUPPORT SYSTEM

- A. Provide an adequate pipe suspension system in accordance with recognized engineering practices using, where possible standard, commercially accepted pipe hangers and accessories.
- B. **Supporting pipes from wood is not permitted**
- C. All pipe hangers and supports shall conform to the latest requirements of the ASA Code for pressure piping, B31.1, and manufacturers' standardization society documents MSS SP-58 and MSS SP-69.

- D. The pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.
- E. All pipe hangers and supports shall be by Erico Caddy, formerly the Michigan Hanger Co.,
- F. Refer to Typical Vertical Piping Support detail on plumbing drawings.
- G. Where concentrated loads of valves, fittings, etc., occur, closer spacing may be necessary. Hangers must be installed not more than 12" from each change in direction of pipes.
- H. Where cast iron pipe is suspended, a minimum of one (1) hanger shall be provided for each length of pipe at each fitting.
- I. Brass chromium plated pipe shall be supported by suitable cast brass chromium plated supports. All securing devices shall have all exposed heads, finished chromium plated. **Wood supports are prohibited.**
- J. All piping shall be supported from the building construction by the use of beam clamps, concrete inserts, brackets, or other equipment as dictated by the type of building construction.
- K. Perforated band iron, wire or chain will not be permitted for hangers or supports of pipe.
- L. **Trapeze type hangers may be used for multiple parallel line installations. The Contractor shall submit sketches for the proposed hangers indicating the type of construction, number and size of lines, and maximum spacing to the Architect for approval.**
- M. Beam clamps - where piping is to be supported from structural steel, beam clamps shall be used. Beam clamp selection shall be on the basis of the required load to be supported. Holes drilled in structural steel for hanger support rods will not be permitted.
- N. Riser clamps - all vertical runs of piping shall be supported at each floor and/or at specified intervals, by means of riser clamps. Copper tubing shall be protected against electrolysis, such as PVC coating or copper plating, or by the use of an all-copper clamp. Riser clamps placed on floor construction in finished areas, including in stairwells, will not be permitted. Supports shall be placed at minimum ten (10) foot intervals for vertical pipe.
- O. Auxiliary steel - all auxiliary steel necessary for the installation of the pipe hangers and supports shall be as designed in accordance with the asic steel handbook, shall be furnished by the Contractor, and shall receive one (1) shop coat of primer paint and one (1) finish coat.

2.4 AIR VENTS AND DRAINS

- A. Air vents shall be of manual type where readily accessible, Dole No. 9, Hoffman, Spirax-Sarco, or approved equivalent.
- B. Air vents above concealed ceiling systems shall be extension type, Dole No. 14-1, Hoffman, Spirax-Sarco, or approved equivalent.

- C. Air vents in accessible areas, but not convenient for service, shall be automatic vent type with the vent pipe carried to the nearest floor drain or acceptable receptacle, Dole No. 200, Hoffman, Spirax-Sarco, or approved equivalent.
- D. Provide a valve on inlet piping to each air vent of all types.
- E. Drain points, consisting of hose end ball drain valves with vacuum breakers, shall be installed for every low point of piping system for drainage.
- F. Condensate drainage shall be provided for all HVAC equipment requiring such drainage. Condensate drain lines shall be extended as shown on the drawings, complete with final connections.

2.5 STRAINERS

- A. Strainers shall be installed as specified or shown in details on drawings.
- B. Strainer body shall be cast bronze to match the system pressure and temperature. The body shall provide for removal of the strainer element without interruption of the pipe. Each strainer shall have a blowdown valve installed. Strainers shall be as manufactured by Watts, Conbraco, Mueller, Spirax-Sarco, or approved equivalent.
- C. Strainer element shall be 0.045" perforated stainless steel with effective screen area of no less than four (4) times the pipe area.

2.6 THERMOMETERS

- A. Thermometers shall be installed as specified or shown in details on the drawings and on the inlet and outlet of every item of equipment where the fluid is either heated or cooled.
- B. Thermometers shall be dial type, with glass face no less than four (4") inches in diameter and with adjustable head for visibility. The body and stem shall be stainless steel.
- C. The range of the thermometer shall be such that the normal operating point with the system in service shall be mid-range on the dial.
- D. Accuracy of the thermometer shall be such that the error will be no greater than 2% of the full scale value.
- E. The thermometer shall be provided with a brass or stainless steel well, installed in a threaded coupling into the pipe being measured. Provide thermally conductive gel in the well for contact with the bulb.
- F. Thermometers shall be as manufactured by Weksler, Ashcroft, Terice, Marshalltown, Weiss, or approved equivalent.

2.7 PRESSURE GAUGES

- A. Provide pressure gauges as specified or shown in details on the drawings and at every item of equipment receiving or producing flow in or from the system.
- B. Gauges, except as herein specified, shall be no less than four (4") inches in diameter with glass face and cast aluminum body.
- C. Range shall be such that the gauge shall operate in mid-range during normal operation of the system. Graduations between figure intervals shall not exceed 10% of the gauge range. Pointer shall be adjustable for calibration.
- D. Accuracy shall be such that error is less than 1% over the mid-range of the gauge and 2% out of the mid-range area.
- E. Every gauge shall be provided with a one-fourth (1/4") inch needle-type valve and an impulse dampener.
- F. Pressure gauges and accessories shall be as manufactured by Weksler, Trerice, Ashcroft, Marshalltown, Weiss, or approved equivalent.

2.8 VACUUM BREAKERS

- A. Where noted or specified, vacuum breakers shall be rough bronze, nonremovable, the Watts No. 8A, Wilkins, Chicago Faucet, or approved equivalent. Chrome vacuum breakers shall be the Watts No. 8AC, Wilkins, Chicago Faucet, or approved equivalent.

2.9 AIR ADMITTANCE VALVES(AAV)

- A. Where noted on the drawings or specified, air admittance valves shall be provided in accordance with Section 917 of the International Plumbing Code and ANSI/ASSE 1051.
- B. AAV'S shall be Redi-Vent type by Studor Manufacturing Co., Sure Vent, Magic Vent by Rector Seal or approved equivalent.

2.10 EXPANSION COMPENSATION

- A. Pipe installation shall allow for expansion due to temperature differences. Provide expansion offsets in piping where necessary to control expansion.

2.11 PIPE SLEEVES

- A. Provide pipe sleeves of Schedule 40 steel pipe at each wall, floor or foundation penetration. Sleeves shall be built into the wall or floor during construction of the wall. Space between pipe and sleeve shall be sealed with a fire stopping material. Where pipes are insulated, the sleeve shall allow for continuous insulation thickness.
- B. Wall sleeves shall be even with both sides of the finished wall.

- C. Floor sleeves shall project approximately one half (½") inch above the finished floor and be even with the underside of the floor. Floor sleeves shall be cast in place or permanently sealed into the floor structure to prevent any water on the floor above from following the pipe system.
- D. Where pipe motion, due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe.
- E. Sleeve installations in exterior and designated interior walls, foundations and slab on grade floors shall consist of steel sleeves with the annular space between the carrier pipe and sleeve continuously filled with modular, mechanical type, inter-locking synthetic rubber links. Sleeves shall be model WS and links, Model LS, all as manufactured by Link-Seal Division, Thunderline Corporation, Advance Products & Systems, Inc., Metraflex, or approved equivalent.
- F. Sleeves through fire rated construction shall be sealed as hereinafter specified under "Fire Barrier Penetration Seals" section of this Specification.

2.12 ESCUTCHEONS

- A. Provide pipe escutcheons of each side of wall or floor penetrations to provide a finished appearance. For insulated pipes, the escutcheon shall surround the outside of the insulation.
- B. Escutcheons shall be chrome, cast brass, setscrew type.

2.13 UNDERFLOOR PIPE SLEEVES

- A. Underfloor pipe sleeves for water lines shall be constructed of 4" diameter minimum size Schedule 40 PVC or terra cotta piping and fittings. Split piping and fittings systems will be acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE SUPPORTS

- A. Install concrete inserts, beam clamps, lag screws or lag bolts in wood, or other fixtures to support the pipe hangers, acceptable to the Architect.
- B. Provide hanger rods and loops or clevises to support the pipe at the height and grade required for proper drainage and air elimination.

3.2 INSTALLATION OF PIPE

- A. All overhead piping shall be installed above the ceiling unless otherwise noted on the drawings.
- B. Cut pipe accurately to measurements, and ream free of burrs and cutting splatter. Carefully align and grade pipe and work accurately into place. Fittings shall be used for any change in

direction. Make adequate provisions for expansion and contraction. Install anchors to prevent pipe movement. Provide for expansion at every building expansion joint.

- C. Protect open pipe ends to prevent trash from being placed in the lines during installation. Clean all dirt and cutting debris from pipes before making the next joint.
- D. Small pipe shall be screwed or soldered as required to produce a tight system with full joints and no leaks. Pipe joints showing seepage and drips shall be dismantled and remade in proper way, as required by proper installation.
- E. Copper pipe shall be carefully reamed back to full inside diameter and the mating surfaces shall be cleaned by brush or sandpaper. When clean, the paste flux shall be applied and the joint evenly heated and soldered. Any fittings discolored by heat shall be removed and replaced.
- F. All valves to be soldered into lines shall be dismantled to prevent the heat from destroying packing and seats.
- G. Valves installed in screwed lines shall be properly supported and pipes carefully installed to prevent damage or distortion of the valve.
- H. Grooved pipe shall be carefully prepared and all burrs removed inside and outside the pipe. The proper lubricant shall be applied and the gasket carefully placed prior to tightening the clamps to the correct torque.
- I. Install ball valve drains at every low place and air vents at every high place. Pipe shall slope as shown on the drawings or in the specifications. If slope is not shown or specified, slope in the direction of flow one (1") inch per every forty (40') feet. Install drain valves and air vents as specified.
- J. Install pressure gauges and thermometers as specified or shown in details and on the drawings.

3.3 EXCAVATION AND TRENCHING

- A. The Contractor shall perform all necessary excavation and backfilling, required for the proper installation of work under this contract.
- B. Excavation for this project shall be considered unclassified and shall include all types of earth and soil, any pebbles, boulders, and bedrock; municipal trash, rubbish and garbage; and all types of debris of the construction industry such as wood, stone, concrete, plaster, brick, mortar, steel and iron shapes, pipe, wire, asphaltic materials, paper and glass.
- C. All such materials encountered which are identified by this paragraph as unclassified shall be removed to the required widths and depths to create a finished product as shown and/or noted on the drawings and as written in the Specifications. No additional compensation shall be made to the Contractor for this unclassified excavation.
- D. The Contractor shall perform all excavation as required to install his work. Earth, debris, rock, or concrete formations required to be excavated, removed, backfilled or graded, shall be as encountered and no additional charge will be allowed by reason of hard or unforeseen formations

of conditions encountered. The excavation work shall be performed on an "unclassified" basis in that the cost of excavation, removal, and disposition of all earth or rock formations shall be included in the contract price at the time of bidding. During excavation, material suitable for backfilling 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 excavated materials not required or suitable for backfilling shall be removed from the site and disposed of in strict accordance with local code requirements, or stockpiled or wasted on the site as directed by the Owner.

- E. 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 for each section of the pipe on undisturbed soil at every point along its entire length. Except where hard rock, cemented gravel, old masonry or other hard material is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are required, the rock shall be excavated to a minimum overdepth of six (6") inches below the trench depths indicated on the drawings or specified. Overdepths in rock excavation and unauthorized overdepths shall be backfilled a minimum of six (6") inches with sand or fine gravel, firmly compacted. Wherever cinders, fill containing refuse, organic matter or similar substances, or wet or otherwise unstable soil incapable of properly supporting the bottom of the trench, such materials shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel or granulated blast furnace slag, firmly compacted. Where necessary, concrete shall be utilized to provide firm support.

3.4 BACKFILLING OF TRENCHES

- A. Trenches shall not be backfilled until all required pressure and other tests have been performed and until the utilities systems, as installed, conform to the requirements of the drawings and specifications, including recording of pipe locations. Final grading by Plumbing Contractor where General Contractor is not performing any work.
- B. All trenches, except as herein specified, shall be carefully backfilled by hand with fine materials approved for backfilling, including only sand, sandy clay and sand gravel. In the event that suitable material as herein specified for trench backfill is not available from trenching or other excavation for the project, the Contractor shall supply and place the requisite additional material without increase in the contract price. Thoroughly compact the backfill herein referred to in layers with a heavy rammer or an approved mechanical tamper. Setting the backfill with water will not be permitted.
- C. Backfill for all piping under slabs on grade, within the building structures, concrete paving, and asphaltic paving shall be with fine materials approved for backfilling, consisting of earth, loam, sandy clay and sand gravel, soft shale or other approved materials, free from large clods of earth or stones, deposited in six (6") inch layers, and thoroughly and carefully rammed. Provide coarse sand or granulated slag to a point of twelve (12") inches above the pipe and backfill the remainder of the trench.
- D. Backfill around and for two (2') feet minimum over pipes installed prior to completion of fills, shall be placed by hand or approved small equipment and compacted to six (6") inch layers as detailed or approved by the Architect. Prior to running heavy equipment over such pipes, the depth, width, and extent of protective backfill shall be approved by the Architect.

- E. For underground gas piping included under this contract, furnish and install 6" of river sand all around piping-under, along side of, and on top of piping. Remaining backfill shall be as specified herein.
- F. The Architect may reject any on-site or bottom material which he considers unsuitable for the intended use of the fill.
- G. Sewer mains will be checked by the Architect to determine whether any displacement of the pipe has occurred after the trench has been backfilled to two (2') feet or more above the pipe. If the pipe line shows poor alignment, displaced pipe or any other defects, such defects shall be remedied by the Contractor at his expense.
- H. Complete installation of all underground piping, including pipe bedding and backfilling, shall be in accordance with all requirements of the local code authorities and utility authorities. The Contractor shall review such requirements with the local authorities prior to commencing work.
- I. Any information on utilities, surface or sub-surface structures, roadways, lines or conditions presented on the contract drawings does not guarantee that these utilities, surface or subsurface structures, roadways, lines or conditions shall be exactly as illustrated and described. It is the Contractor's responsibility to obtain and/or verify such information prior to construction in order that he may provide an installation in complete conformity with design intent of the project.
- J. The Contractor shall maintain the work safe to human life and property in conformance with all local, state and federal safety regulations.
- K. Any structures and existing services damaged in the course of the work shall be repaired by the Contractor in kind equal to or surpassing the existing installation.
- L. All plumbing contract work in public highway, street, or right-of-way is the responsibility of the Contractor. The Contractor shall make all necessary arrangements with appropriate governing or municipal agency, make repairs, obtain and pay for all permits, inspection fees, tapping fees, obtain approvals and all other incidental costs of work, relative to work under this contract.
- M. Provide marking strip for each underground utility included under this contract. Refer to "Utilities", Section 22 05 00.

3.5 CLEANING AND TREATING OF PIPE SYSTEMS

- A. Every pipe system shall be cleaned to remove trash, mill scale, cutting oil, welding, and burning splatter from the lines before any control devices are installed. If such debris has collected in valves, the valves shall be disassembled and cleaned prior to closing for the first time.
- B. Brush and clean work prior to concealing, painting, and acceptance. Perform in stages if directed.
- C. Clean and repair painted exposed work, soiled or damaged, to match adjoining work before final acceptance.

- D. After several hours of operation, each strainer shall be blown down. This shall be repeated as often as necessary to produce a clean discharge from the blowdown. Prior to turning the system over to the Owner, each strainer shall be removed and cleaned.

3.6 TESTING

- A. Refer to "Plumbing Tests", Section 22 05 05.10.
- B. Pipe and fittings shall be tested before any insulation or other covering is applied.
- C. Testing may be performed in sections before vital equipment is connected, if the test pressure is above the equipment rating.
- D. Test medium shall be water under hydrostatic pressure with all air removed from the system. With the Architect's consent, the test may be performed with compressed air to prevent danger from freezing. Questionable joints shall be soaped to prove tightness.
- E. The Architect shall observe all tests. Notice to the Architect shall be given 2 full days before
- F. The testing is to be performed.
- G. The contract shall obtain certificates of approval, acceptance, and compliance with regulations of all agencies having jurisdiction. Work shall not be deemed complete until such certificates have been delivered to the Architect.

END OF SECTION 22 05 10

SECTION 22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.Scope
- B. The pipe insulation shall be as hereinafter described in this Section.

1.2 CODE COMPLIANCE

- A. All insulation materials and installation procedures shall be in accordance with the minimum requirements of applicable State energy code acts.

PART 2 - PRODUCTS

2.1 INSULATION

- A. Pipe insulation shall be as manufactured by Owens Corning, Knauf, Manville, or approved equivalent. Insulation sundries and adhesives shall be made by Benjamin Foster, Childers, Vimasco, or approved equivalent. Thicknesses shall be in accordance with the following schedule:

MINIMUM PIPE INSULATION

	Up to 1 ¼"	Up to 1 ½"	Up to 2 ½" and larger
<u>Domestic Hot Water Supply</u>			
100° Fahrenheit and Greater	1.0"	1.0"	1.0"
<u>Domestic Cold Water</u>			
Domestic Cold Water 40°-60° Fahrenheit	1.0"	1.0"	1.0"

- B. The type of insulation shall be the following:
 - 1. Piping insulation shall be "Heavy Density," 1-piece molded fiberglass with factory applied Type ASN/SSL "All Service" jacket with self-sealing lap. Average thermal conductivity shall not exceed .25 btu-in per square foot per degrees fahrenheit per hour at

- a mean temperature of 75 degrees. Thickness shall conform to schedule for pipe size and service as specified herein. Insulate roof drain bodies.
2. Vapor-barrier jacket shall be white kraft paper bonded to aluminum foil and reinforced with glass fiber, and pressure sensitive, self-sealing lap adhesive conforming to the physical properties listed in next paragraph.
 3. The insulating system, including insulation, jacket adhesives, mastics and cements, shall have composite fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723, not exceeding:
 - a. Flame Spread: 25
 - b. Fuel Contributed: 50
 - c. Smoke Developed: 50
 4. All products or their shipping cartons shall have label affixed indicating smoke and flame ratings.
 5. Fittings shall also be 25/50/50 rated as described above.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. This Contractor shall furnish and install non-conducting covering on the following piping and apparatus installed under this contract. For performing this work, this Contractor shall employ an insulation subcontractor specializing and experienced in covering work, and approved by the Architect.
- B. Except chrome plated piping at plumbing fixtures and equipment, all domestic water piping shall be insulated, exposed and concealed. Insulate all HVAC condensate drains, exposed and concealed.
- C. Insulate make-up cold water piping.
- D. All exposed hot, cold, and drain piping below lavatories for handicapped and/or wheelchair use shall be insulated, Mcguire, Truebro, Brocar, Plumberex, Zurn, or approved equivalent. Include insulation of p-trap. Refer to section 22 40 00, "Plumbing Fixtures".
- E. All valve bodies, fittings, and flanges in all piping specified to be covered shall be insulated the same as the piping service.
- F. Application of insulation materials to piping shall be done in accordance with the manufacturers' written recommendations. Where thickness of insulation is not specified, use applicable thicknesses recommended by the manufacturer for the specific use.
- G. All pipe insulation shall be installed with joints butted firmly together. All valves and fittings shall be insulated with mitered sections of insulation equivalent in density and thickness to the adjoining insulation or with insulating cement equivalent in thickness to adjoining insulation or with "Zeston" Type, Proto Corp., or approved equivalent, premolded PVC fittings installed in

accordance with the manufacturers' instructions. Fittings shall be finished with 8 oz. Glass mesh and mastic (use breather mastic on systems operating 50° fahrenheit; a vapor barrier mastic on systems operating from 50° fahrenheit down). Jackets on pipe insulation shall be stapled using outward clinch staples spaced three (3") inches apart at least one-fourth (1/4") inch in from the lap edge of systems. All insulation shall be stapled, tapered, and sealed regardless of service.

- H. "Concealed" shall mean hidden from sight as in chases, furred spaces, pipe shafts or hung ceilings. "Exposed" shall mean that piping or equipment is not "Concealed" as defined hereinabove. Piping and equipment in service tunnels, mechanical equipment rooms, storage areas, or unfinished rooms shall be considered "Exposed".
- I. All insulation shall be continuous through wall and ceiling openings, sleeves and supports. All covered pipe shall be located a sufficient distance from walls, other pipes, ductwork, and other obstacles to permit the application of the full thickness of insulation specified; and if necessary, extra fittings and pipes are shall be used.
- J. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers on cold lines (under 50° Fahrenheit) shall be sized large enough to be installed over the outer surface of the insulation. Load distributing corrosion-resistant metal shields shall be installed around the lower one-third (1/3) circumference of the insulation. Shields shall be 12 gauge for pipe sizes six (6") inch and larger; 16 gauge for smaller sizes. Length of the shield shall be twelve (12") inches up through six (6") inches; and sixteen (16") inches for over six (6") inches.
- K. Pipe sizes greater than three (3") inches ips require supplementary load bearing material, the same thickness as the insulation used in combination with the hanger shields to resist compression of the insulation.
- L. Concealed work needs no further finish.
- M. Insulate water lines within and around cabinetry and casework, installed under this contract. Insulate water meters, backflow preventers, pressure reducing valves, and strainers.
- N. Do not insulate underground cold water piping in direct contact with the ground.
- O. Do not insulate unions.
- P. Cover heater expansion tank with 1" semi-rigid fiberglass board in roll form faced with a factory applied ASJ vapor retarder, 25/50 rated, conforming to ASTM C-795.
- Q. Hot water heater shall be furnished with a factory insulated jacket as specified with that equipment.
- R. Insulate inlets and outlets of trap primers, and outlets of trap primer distribution units. Insulate bottom of distribution units.

END OF SECTION 22 07 00

SECTION 22 11 16 – DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.Scope
- B. The domestic hot and cold water piping shall be as hereinafter described in this Section.

PART 2 - PRODUCTS

2.1 UNDERGROUND DOMESTIC WATER SERVICE PIPING

- A. Pipe: Underground domestic water service distribution piping, including interior domestic water lines below floor level in direct contact with the earth, shall be hard drawn copper tubing, Type “K”, in accordance with ASTM B-88, (certified tube; including dimensions). Soft temper, Type “K”, copper tubing acceptable. Standard copper tubing not meeting ASTM B-88 dimensional requirements will not be acceptable. Maintain 4’ – 0” minimum ground cover over top of exterior piping.
 - a. Fittings: Coated American – made silver soldered fittings, or flared (compression) fittings.
- B. The use of any of the above listed materials shall be subject to the acceptability of that material with the prevailing local codes and utility company regulations. All water line installations shall conform to the requirements of the local water authority serving the building.

2.2 HOT AND COLD WATER PIPING ABOVE GROUND, INSIDE BUILDING

- A. All shut-off valves in water lines shall be ball type. Hose end ball valves with vacuum breakers shall be installed at all low points of piping system for drainage.
- B. All valves for general use shall be Nibco Inc., Apollo, Milwaukee, Crane, Watts, or approved equivalent.
- C. Bronze valves, including check valves, shall be made to be “Dezincification Resistant”, with metal components in the waterway, or not containing more than 15% zinc in their chemical makeup.
- D. All valves shall be designated for a minimum 125 pounds per square inch (S.W.P.), 200 pounds per square inch (W.O.G.).

- E. The name or trademark of the manufacturer and the guaranteed working pressure shall be cast or stamped on the body.
- F. Pipe, All Sizes: Hard copper, Type 1, ASTM B-88 (certified tube, including dimensions). Standard copper tubing not meeting ASTM B88 dimensional requirements will not be acceptable. Soft temper, Type 1, copper tubing, acceptable in underfloor pipe sleeves, same specification.
 - 1. Fittings: Solder type wrought copper, American-made. If the Contractor so desires, the T-Drill system will also be acceptable, and by Certified Mechanics only, as hereinafter specified. A copper grooved mechanical system and the propress system will also be acceptable, as hereinafter specified.
 - 2. Ball Valves: Valves shall be manufactured by Nibco, No. T/S-580-70, or approved equivalent. Valves shall conform to MSS SP-110. The Nibco "Nib-Seal" insulated ball valve will be acceptable. The Apollo Series 77C-200-AO full port bronze ball valve with 2" tube extensions and conforming to MSS SP-110, or approved equivalent, will be acceptable for installation with the propress tubing assembly system.
 - 3. Check Valves: Check valves in water lines, all bronze construction, horizontal swing, Nibco model S-413/T-413, or approved equivalent. Valves with brass discs shall be regrinding type. Valves shall conform to MSS SP-80.
 - 4. Drain Valves: All bronze ball type construction with vacuum breaker, Nibco, or approved equivalent.
 - 5. Unions: wrought copper, ground joints, and solder ends – Nibco, or approved equivalent.
- G. Exterior Wall Hydrants: Type WH-1: Zurn No. Z1320-CL series encased ecolotrol "Anti-Siphon" automatic draining wall hydrant for flush installation, Josam, Watts, Wade, or Smith. Complete with non-freeze type integral backflow preventer, bronze casing, all bronze interior parts, non-turning operating rod with free-floating compression closure valve, replaceable bronze seat and seat washer, 3/4" inlet/outlet, and key-operated control valve. Nickel-bronze box and hinged cover with cylinder lock and "Water" cast on cover. Nickel-bronze cover with polished face. A stainless steel wall hydrant will not be acceptable. Mount wall hydrants with centerline 2' - 0" above finished grade.
- H. Backflow Preventers (Except as Herein Specified): Reduced pressure zone type, bronze, Watts Series 909QT-S, with 909-AG air gap fitting piped to nearest drain, Wilkins, Conbraco, or approved equivalent. Quarter turn, full port ball valves and strainer, with bronze body ball test cocks. A stainless steel backflow preventer will be acceptable.
- I. Double Check Valve Backflow Preventer - 2": Backflow preventer shall be the Watts Model 007MIQT-S, 2" size, Wilkins, Conbraco, or approved equivalent. Valve shall have cast bronze construction. Valve shall include locked lever handle ball shutoffs, replaceable seats and seat discs, strainer, and test cocks. For back siphonage and backpressure backflow. A stainless steel backflow preventer will be acceptable. Provide quality locks with keys to Owner, Yale, Master Lock, Bundy, or approved equivalent.

- J. Small Dual Check Backflow Preventers: All bronze body, the Watts No. L7U2-2EZ-TC-QT, Wilkins, Conbraco, or approved equivalent, with bronze body ball test cocks and quarter turn, full port valves. Provide strainer ahead.
- K. Other Backflow Preventers ½" And Smaller: All bronze body, reduced pressure zone type, the Watts No. 009QT-S, with 909-AG air gap fitting piped to nearest drain, Wilkins, Conbraco, or approved equivalent. Quarter turn, full port valves, with bronze body ball test cocks, with tee handle shutoffs, and strainer.
- L. Type HB-1 Hose Bibbs: Single hose bibbs shall be the T & S Brass No. B-0720-RGH, modified with four arm handle, rough chrome, with integral atmospheric vacuum breaker, Chicago Faucet, Zurn, or approved equivalent. Polished chrome hose bibb acceptable. Mount hose bibbs with centerline 36" to 42" above finished floor.
- M. Vacuum Breakers: Refer to Section 22 05 10.

2.3 VALVES (GENERAL)

- A. Furnish and install all valves necessary to the proper operation of the system. A valve shall be placed where each branch leaves the main and at such points, as required for the proper control and shut-off of all lines. Each piece of equipment that may have to be removed from the system for repair shall be connected by union or flange, and provided with isolation valves.

2.4 STOPS

- A. Each plumbing fixture furnished under this Contract and each piece of special equipment furnished under other contracts or by the Owner shall, unless otherwise shown or specified, be provided with a compression stop valve on the water supply lines. On copper lines, ball valves shall be installed on branch water lines to equipment. Stops shall be finished brass, chrome-plated where exposed and shall be provided with key control.

2.5 WATER HAMMER ARRESTORS

- A. Furnish and install at high points on hot and cold water risers, at back-up reclamation system cold water supply, and where otherwise required, Zurn Z1700, Josam, Wade, or Smith water hammer arrestors, or approved equivalent, of stainless steel or minimum Type "K" or Type "L" copper. Air chambers will not be permitted.
- B. Arrestors shall be certified, constructed, and tested in accordance with the recommendations of the Plumbing and Drainage Institute Standard PDI-WH-201 and shall bear their seal of approval.

2.6 ACCESS PANELS

- A. Where required for access to concealed strainers, valves, and other plumbing equipment, all removable panels complete with frame shall be furnished by this Contractor, turned over to the General Contractor for installation. Panels shall be of sizes required for their intended service

and shall be of the type and material required for the finish and construction into which they are installed. Access panels in fire rated ceilings or walls shall be similarly rated (refer to Architect's finish schedule). Panel sizes shall be a minimum of 18" x 18", or larger as directed.

- B. In suspended lay-in ceilings, use tile in place of access panel and provide in such tile a means of identification as hereinbefore specified.
- C. For acoustical ceilings, conform to architectural panel pattern. Access panels and doors shall have concealed hinge and vandal-proof operated cam lock. Access doors accessible from corridors; toilet rooms and other public areas shall be Style TMS stainless steel.
- D. Access panels shall be J. L. Industries, Zurn, Karp, or approved equivalent. Styles shall be compatible with the surrounding construction.

2.7 PRESSURE REDUCING VALVES

- A. Pressure reducing valves shall be of bronze construction, the Watts Series 223 or N223b as required, or approved equivalent.
- B. Furnish and install a strainer ahead of each pressure reducing valve, of type specified. Reducing valve with integral strainer will be acceptable.
- C. Comparable pressure reducing valves as manufactured by Cash-ACME, Mueller, Conbraco, Spirax-Sarco, or approved equivalent, will be acceptable.

2.8 WATER METERING EQUIPMENT

- A. Water meter will be furnished by the water authority for installation by the plumbing Contractor. Exact rough-in dimensions shall be obtained from the water authority before rough-in. All costs shall be included in the plumbing contract as required; obtain exact costs from water authority. Coordinate all remote meter reading installations with the water authority, perform all related work, and include such costs in the contract price.

PART 3 - EXECUTION

3.1 WATER DISTRIBUTION

- A. All buried pipe for water service shall be installed to prevent any movement or blow-out of fittings due to pressure surges in the line. Provide concrete anchoring as required by the water authority. Provide restraining rods at the building entrance. Water piping shall be installed with a minimum ground cover over top of pipe of four feet zero inches 4'-0", or as additionally required by the water authority. All excavation and backfilling shall conform to the water authority. The entire installation shall conform to water authority requirements. Confirm requirements prior to bidding.
- B. Interior water piping shall be installed exposed on ceilings and walls in unfinished areas and concealed in pipe spaces, chases, partitions, floor or ceiling construction, and in spaces above dropped ceilings of all other areas or as shown and noted on the drawings. All piping shall be

installed in spaces and adjacent to other surfaces with sufficient clearances to permit air relief of the hot water system. Air venting valves shall be installed at all trapped high points in the hot water piping. Air venting valves shall be as hereinbefore specified; refer to Section 22 05 10.

- C. Provide a shut-off valve at the base of up-fed water risers and at the top of down-fed water risers with a drain valve at the base of all water risers.
- D. All exposed piping and fittings at fixtures shall be polished chrome plated.
- E. Refer to section 22 05 05.10 for plumbing testing.
- F. The water system shall be thoroughly flushed upon completion of the installation. Clean out all affected strainers.

3.2 JOINTS AND CONNECTIONS

- A. Joints in copper tubing shall be assembled with lead-free solder using a non-corrosive flux. All copper tubing and fittings of 2" size shall be tinned prior to making solder joint.

3.3 DISINFECTION OF WATER SYSTEM

- A. Before being placed in service all water lines, interior and exterior, included under this contract work, shall be chlorinated to the satisfaction of the Architect.
- B. Prior to chlorination, all dirt, foreign matter shall be removed by a thorough flushing.
- C. A water mixture of hypochlorite solution shall be applied by means of a solution-feed device.
- D. Treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. This period shall be at least 3 hours and preferably longer as may be directed.
- E. After the chlorine treated water has been retained for the required time, the chlorine residual at the pipe extremities and at other representative points shall be at least 5 parts million.
- F. Following chlorination, all treated water shall be thoroughly flushed from the newly installed pipe line at its extremities until the replacement water throughout its length shall, upon test, be equal to the water quality served from the municipal water supply system.
- G. Should the initial treatment, in the opinion of the Architect, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show the water sampled from the newly installed pipe conforms to the requirements.

3.4 ELECTROLYSIS CONTROL

- A. The installation of copper tubing shall be accomplished in such a way as not to touch or come in contact in any way with ferrous metal. Where copper tubing, piping, or fittings are anchored, supported or may come in contact with metal construction, an insulating nonconductor spacer similar to lead, rubber, fiber or plastic shall be installed to assure prevention of electrolysis.

- B. Hangers supporting copper tubing shall be copper, copper-plated or be large enough to accommodate the insulating pipe covering. Copper tubing lines shall not be (even temporarily) supported or secured to ferrous metal.
- C. Connections between ferrous and copper piping shall be with dielectric fittings. Dielectric fittings shall be as manufactured by Watts, Wilkins, Walter Vallett, Clearflow, or approved equivalent.

3.5 BRANCH PIPING TO FIXTURES AND EQUIPMENT

- A. Branch or runout piping shall be extended and connected to all fixtures and equipment requiring same. Sizes of such connections shall be as shown on the drawings or as required by the particular piece of equipment being served. If the sizes of such connections are not clearly indicated, the Contractor shall verify the sizes required with the Architect prior to

commencement of any roughing-in work. Changes to piping necessitated due to the Contractors' failure to properly verify the required sizes shall be made at the Contractors' expense.

END OF SECTION 22 11 16

SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.Scope
- B. The soil, waste, and vent piping systems shall be as hereinafter described in this Section.
- C. All pipe materials shall be subject to the acceptability of that material with the prevailing local plumbing code.

PART 2 - PRODUCTS

2.1 SANITARY SEWER AND VENT PIPING BURIED UNDERGROUND (INSIDE BUILDING)

- A. Pipe: Service weight cast iron soil pipe; polyvinyl chloride (PVC) Schedule 40 plastic pipe (DWV) ASTM 2665.
- B. Fittings: Service weight cast iron soil pipe type; or Schedule 40 PVC.
- C. Joints: neoprene compression gasket or leaded; PVC solvent cemented joints.
- D. In main mechanical equipment room, for sanitary soil, waste, and vent lines, use cast iron only below floor to a point 10' – 0" outside the area in all directions, due to hot discharges.
- E. Extra heavy weight cast iron soil pipe and fittings shall be utilized where required by local codes.

2.2 SANITARY SOIL, WASTE, AND VENT PIPING ABOVE GROUND (INSIDE BUILDING)

- A. Pipe: Cast iron "No-Hub" or Type "DWV" copper.
 - 1. Schedule 40 PVC is permitted where pipe is not exposed.
- B. Fittings: Cast iron "No-Hub" or DWV copper solder joint cast bronze or wrought copper drainage fittings, American-made, or PVC.
- C. Joints: For cast iron, neoprene gasket with stainless steel band and screws, as manufactured by clamp-all, husky, mission, or approved equivalent; soldered for copper joints.

- D. Vents: Vent lines to atmosphere shall be minimum 3" diameter and terminate a minimum of 12" above roof level. Terminate vent lines at a higher height above roof level where required by local codes. Rigidly support all vent lines extending through roof.

2.3 TRAPS

- A. Service weight or extra heavy weight cast iron, wrought copper, in accordance with applied piping system.
- B. A separate trap shall be provided for each plumbing fixture, which does not contain an integral trap. In general, all fixture traps shall be provided with accessible cleanout plugs located on the bottom of the bend.
- C. Traps shall be set true with respect to their water seals.
- D. Provide building sanitary sewers included under this contract work, each with house traps, vents, and cleanouts as required by prevailing plumbing code. Provide traps of same materials as applied piping system.

PART 3 - EXECUTION

3.1 JOINTS

- A. Joints in cast iron soil pipes shall be made with compression gaskets. Compression gaskets shall be neoprene, service weight or extra heavy weight as necessitated by the pipe, "Ty-Seal" as made by Tyler Pipe Co., Eastern, Charlotte, Richmond, or approved equivalent.
- B. Fittings for "No-Hub" cast iron soil pipe shall be of the same weight class as the pipe. Joints shall be made with "No-Hub" neoprene sealing sleeves and stainless bolted clamps.
- C. Screw joints shall be fitted accurately and put together with red lead and boiled linseed oil or other approved compound. The surplus lead shall be wiped off before making joints. The ends of all pipes shall be reamed free of burrs before joints are made. Threads shall be cleaned, tapered, and cut so as not to extend beyond the fittings.
- D. Joints between cast iron and steel, brass or copper lines shall be made with approved ring or coupling forming a spigot end into which the steel or copper or brass pipe is screwed.
- E. Fittings for Type L, hard temper copper waste pipe lines shall be wrought copper or cast bronze soldering drainage fittings, American-made. Solder joints in copper tubing shall be made up as follows. Ends of tubing and inside jointing surfaces of fittings shall be wiped with emery cloth; tubes, and fittings heated to a uniform temperature and solder fed until a ring of solder is visible around the tube at the end of the fittings. Wipe joint clean of all excess solder. Tubes shall be held rigid until the solder has cooled.
- F. Joints between pipes of dissimilar materials shall be made with pre-fabricated flexible couplings and joint sealers as specified herein for transition joints.

- G. Joints in interior PVC piping shall be made with socket type fittings and solvent-cement welding, above floor or below bottom floor. Joints in exterior PVC sewer piping shall be made with flexible elastomeric seal (ASTM D3212).
- H. All joints shall be made permanently gas and water tight.
- I. For above ground drainage piping changes in direction, use long sweep fittings where possible; otherwise, short-sweep 1/4 bends, or combination y and 1/8 bends, also y's or in combination with other bends; use 45 degree y or 90 degree y short turn type for horizontal branches discharging to stacks; however, approval must be obtained for these locations.
- J. Unless noted otherwise on the Drawings or required to suit grades or conditions, all main lines shall be installed with a uniform slope of 1/8" to the foot and all branch lines shall be installed with a uniform slope of 1/4" to the foot, or as otherwise required by local codes. Maintain 30" minimum ground cover above exterior piping.

3.2 TRANSITION JOINTS

- A. All transition joints in sewers between similar or dissimilar materials of equivalent or an equivalent size shall be made gas and water tight by means of an approved connector or adapter of the compression or mechanical seal type. The connector or adapter shall be manufactured of preformed elastomeric plastic, conforming to the applicable sections of ASTM standards C-425, C-443, C-564, and D-1869.
- B. Couplings of the mechanical seal type shall have tightening clamps or devices made of series 300 stainless steel. The compression joint connector or adapter and flexible coupling shall be installed as recommended and specified by the manufacturer. Each connector shall bear the manufacturers' name clearly visible. Connectors shall be as manufactured by Fernco Joint Sealer Company, Indiana Seal, NDS, Inc., or approved equivalent.

3.3 ELECTROLYSIS CONTROL

- A. The installation of copper tubing shall be accomplished in such a way as not to touch or come in contact in any way with ferrous metal. Where copper tubing, piping, or fittings are anchored, supported or may come in contact with metal construction, an insulating nonconductor spacer similar to lead, rubber, fiber or plastic shall be installed to assure prevention of electrolysis.
- B. Hangers supporting copper tubing shall be copper, copper-plated or be large enough to accommodate the insulating pipe covering. Copper tubing lines shall not be (even temporarily) supported or secured to ferrous metal.
- C. Connections between ferrous and copper piping shall be with dielectric fittings. Dielectric fittings shall be as manufactured by Watts, Wilkins, Walter Vallett, Clearflow, or approved equivalent.

3.4 FLASHINGS

- A. Openings in roof for extended vent piping will be flashed under the General Contract - Roofing Contractor.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.Scope
- B. The sanitary specialties shall be as hereinafter described in this Section. Make all required connections into the sanitary drainage systems.

1.2 CODE COMPLIANCE

- A. All sanitary specialty materials and installation methods shall be in accordance with the prevailing local plumbing codes.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

- A. The contractor shall furnish and install the following types of drains, by Zurn, Josam, Watts, Wade, or Smith. The following numbers are from the Zurn catalog.
 - 1. FD-1: Zurn ZN415-B series, bottom outlet, coated cast iron body with polished nickel-bronze strainer, ZN400, Type B, or approved equivalent. Strainers shall be 6" size. (Finished areas.)
 - 2. FD-2: same as FD-1, except with cast iron type Z328-4 4" oval funnel assembly, or approved equivalent. (Equipment and work areas.)

2.2 CLEANOUTS

- A. All cleanout equipment shall be as manufactured by Zurn, Josam, Watts, Wade, or Smith. The following numbers are from the Zurn catalog:
 - 1. ZN1443-VP or ZN1447-VP cleanout with nickel-bronze access cover with vandal-proof screws, for or all lines concealed (less cover on exposed lines). For all locations other than where access panels or doors are noted. Plastic, PVC, or fiberglass type cleanout covers not acceptable.
 - 2. ZN1400 adjustable floor cleanout with round top, for use maintenance, equipment, and storage areas.

3. ZN1400-t adjustable floor cleanout with square top, for use at exposed locations receiving resilient floor tile finish.
- B. For cleanouts on cast iron lines or copper lines above floor level as described herein, cleanouts shall be cast bronze threaded plugs in wye fittings. For PVC lines above floor level as described herein, cleanouts shall be PVC threaded plugs in wye fittings.
- C. The Contractor shall lubricate all plugs before installation and shall loosen all covers and plugs before final inspection as directed by the Architect.

2.3 FLASHING

- A. Cleanouts shall be furnished and installed with flashing flanges and clamping collars. Provide 48" square sheet lead, copper or neoprene flashing set integral with floor slab. Chloroloy or equivalent flashing will be acceptable

PART 3 - EXECUTION

3.1 GRADE

- A. Elevations of drains shall be adjusted to avoid interference with other utilities without additional expense.

3.2 FLASHING

- A. Provide 48" square sheet lead, copper, or neoprene flashing set integral with floor slab. Chloroloy, or approved equivalent non-plasticized chlorinated polyethylene waterproofing membrane will be acceptable for flashing of floor drains.
- B. All drains shall be furnished and installed with flashing flanges and clamping collars.

3.3 INSTALLATION

- A. Set each drain over a p-trap.
- B. Exercise extreme care to prevent debris from entering drains. Check carefully invert elevations of drains to which connections are to be made.
- C. Flush all drain lines with water in sufficient volume to obtain free flow through each line. Remove all obstructions and correct all defects discovered.
- D. Cleanouts shall be provided at the base of each storm, soil, waste, condensate, and drain stack; and also at the ends of all storm, condensate, and sanitary drains at each change of direction in drainage lines greater than 45 degrees. Cleanouts shall be installed at intervals not to exceed fifty (50') feet for four (4") inch lines and one hundred (100') feet for lines larger than four (4") inches in all straight runs of sanitary and storm house drains and elsewhere as shown on the

drawings or as required by the local authorities. Cleanouts shall be provided on all branches to fixtures and for all accessible traps.

- E. Cleanouts installed on underground or under-floor lines or lines below slab on grade floors shall be extended to grade or floor level with 45 degree fittings.
- F. Cleanouts on concealed piping shall be extended so as to be easily accessible from finish floor, ceiling, or wall.
- G. Where vertical piping is installed in chases in finished rooms, extension pieces, if required, shall be placed in tees so as to bring cleanout plugs to the back of the cover plate set flush in the finished walls.
- H. Except where cover plates are provided with a recess for inserts of the same material as the floor finish, all cover plates in floors shall be scoriated nickel bronze. Frames for the cover plates shall be compatible with the finished flooring material.
- I. Each cleanout shall be of the same size as the line served, except the cleanouts on lines larger than four (4") inches shall be (4") inches in size, if approved by the local authorities having jurisdiction.
- J. Care shall be exercised in installing cleanouts to avoid locating them in surfaces to be carpeted. Provide additional piping as required to locate cleanouts in other more accessible surfaces.

3.4 FINAL INSPECTION

- A. At the time of final inspection of the work performed under the contract, the drains shall be complete in every respect and in perfect operating condition. All surplus materials of every description resulting from the work shall have been removed. Drains shall be free from sand, silt or other obstructions. Any defects discovered in the drains subsequent to this inspection shall have been corrected.

END OF SECTION 22 13 19

SECTION 22 33 00 - ELECTRIC, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Commercial, electric, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: For commercial domestic-water heaters, accessories, and components, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- C. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Five years.
 - b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A. O. Smith Corporation.
 - b. Bradford White Corporation.
 - c. Lochinvar, LLC.
 - d. Rheem Manufacturing Company.
 - e. State Industries.
 - 2. Standard: UL 1453.
 - 3. Storage-Tank Construction: Non-ASME-code, steel vertical arrangement.
 - a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

- 1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
- b. Pressure Rating: 150 psig (1035 kPa).
- c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
 - h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
5. Special Requirements: NSF 5 construction.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. **Manufacturers:** Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. A. O. Smith Corporation.
 - b. AMTROL, Inc.
 - c. State Industries.
 - d. TACO Comfort Solutions, Inc.
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

- c. Air-Charging Valve: Factory installed.
- 4. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig (1035 kPa).
 - b. Capacity Acceptable: 2 gal. (7.6 L) 4 gal. (15.1 L) 7 gal. (26.5 L) 10 gal. (37.9 L) minimum.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig- (172.5-kPa-) maximum outlet pressure unless otherwise indicated.
- F. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- J. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.
- K. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting

and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters.
1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor, is indicated.
 2. Maintain manufacturer's recommended clearances.
 3. Arrange units so controls and devices that require servicing are accessible.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
 8. Anchor domestic-water heaters to substrate.
- B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

- F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- H. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig (172 kPa). Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."
- I. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- J. Fill electric, domestic-water heaters with water.
- K. Charge domestic-water compression tanks with air, if not pre-charged at the factory.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

END OF SECTION 223300

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
 - 1. Faucets for lavatories, bathtub/showers, showers, and sinks.
 - 2. Flushometers.
 - 3. Toilet seats.
 - 4. Protective shielding guards.
 - 5. Fixture supports.
 - 6. Interceptors.
 - 7. Water closets.
 - 8. Urinals.
 - 9. Lavatories.
 - 10. Commercial sinks.
 - 11. Service basins.
 - 12. Owner-furnished fixtures.
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
 - 2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
 - 3. Division 22 Section "Drinking Fountains and Water Coolers."
 - 4. Division 31 Section "Facility Water Distribution Piping" for exterior plumbing fixtures and hydrants.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section..

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 4. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
 5. Stainless-Steel Residential Sinks: ASME A112.19.3.
 6. Vitreous-China Fixtures: ASME A112.19.2M.
 7. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucets: ASME A112.18.1.
 5. Hose-Coupling Threads: ASME B1.20.7.
 6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 7. NSF Potable-Water Materials: NSF 61.
 8. Pipe Threads: ASME B1.20.1.
 9. Supply Fittings: ASME A112.18.1.
- I. Comply with the following applicable standards and other requirements specified for bathtub/shower and shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Faucets: ASME A112.18.1.
 3. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. Manual-Control Antiscald Faucets: ASTM F 444.
 6. Pipe Threads: ASME B1.20.1.
 7. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Plastic Tubular Fittings: ASTM F 409.
 5. Brass Waste Fittings: ASME A112.18.2.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Flexible Water Connectors: ASME A112.18.6.
 2. Floor Drains: ASME A112.6.3.
 3. Grab Bars: ASTM F 446.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. Off-Floor Fixture Supports: ASME A112.6.1M.
 6. Pipe Threads: ASME B1.20.1.

7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures of unit shell.
 - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 2. Warranty Period for Commercial Applications: 3 year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
 3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.
 4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
 5. Flushometer Tank, Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than 2 of each type.
 6. Water-Closet Tank, Repair Kits: Equal to 5 percent of amount of each type installed.
 7. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

- A. Lavatory Faucets:
 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:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Bradley
 - b. American Standard Companies, Inc.
 - c. Chicago Faucets.
 - d. Delta Faucet Company Commercial
 - e. Eljer
 - f. Kohler.
4. Description: Two-handle mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 - a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: 0.5 gpm.
 - d. Maximum Flow: 0.25 gal.
 - e. Centers: 8 inches.
 - f. Mounting: Deck, exposed.
 - g. Valve Handle(s): Wrist blade, 4 inches.
 - h. Inlet(s): NPS 3/8 tubing, plain end.
 - i. Spout: Rigid.
 - j. Spout Outlet: Spray, 0.5 gpm.
 - k. Operation: Compression, manual.
 - l. Drain: Grid.
 - m. Tempering Device: Mechanical.

2.2 SINK FAUCETS

A. Sink Faucets:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
Chicago Faucets.
 - b. Delta Faucet Company Commercial
 - c. Moen, Inc. Commercial
 - d. Kohler.
4. Description: Laundry tray faucet. Service sink faucet with stops in shanks, vacuum breaker, hose-thread outlet, and pail hook. Bar sink faucet. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

- a. Body Material: Commercial, solid brass.
- b. Finish: Polished chrome plate.
- c. Maximum Flow Rate: 1.5 gpm, unless otherwise indicated.
- d. Mixing Valve: Two-lever handle.
- e. Backflow Protection Device for Hose Outlet: Not required.
- f. Backflow Protection Device for Side Spray: Not required.
- g. Centers: 8 inches.
- h. Mounting: Deck.
- i. Handle(s): Lever, Wrist blade, 4 inches.
- j. Inlet(s): NPS 3/8 plain-end tubing.
- k. Spout Type: Rigid, solid brass.
- l. Spout Outlet: Aerator.
- m. Vacuum Breaker: Required.
- n. Operation: Compression, manual.
- o. Drain: Grid.

2.3 FLUSHOMETERS

A. Flushometers:

- 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:
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Sloan Valve Company.
 - b. Zurn Plumbing Products Group; Commercial Brass Operation.
 - c. Kohler.
- 4. Description: Flushometer for urinal-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
 - a. Internal Design: Diaphragm operation.
 - b. Style: Exposed.
 - c. Inlet Size: NPS 3/4.
 - d. Trip Mechanism: Oscillating, lever-handle actuator.
 - e. Consumption: 0.5 gal./flush or as scheduled.
 - f. Tailpiece Size: NPS 3/4 length to top of bowl.

2.4 TOILET SEATS

A. Toilet Seats:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
 - b. Bemis Manufacturing Company.
 - c. Centoco Manufacturing Corp.
 - d. Church Seats.
 - e. Eljer.
 - f. Olsonite Corp.
 - g. Kohler.
4. Description:
 - a. Toilet seat for private water-closet-type fixture.
 - 1) Material: Molded, solid plastic with antimicrobial agent.
 - 2) Configuration: Closed front with cover.
 - 3) Size: Elongated.
 - 4) Hinge Type: SC, self-sustaining, check.
 - 5) Class: Standard commercial.
 - 6) Color: White.
 - b. Toilet seat for public water-closet-type fixture.
 - 1) Material: Molded, solid plastic with antimicrobial agent.
 - 2) Configuration: Open front with cover.
 - 3) Size: Elongated.
 - 4) Hinge Type: SC, self-sustaining, check.
 - 5) Class: Standard commercial.
 - 6) Color: White.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers :

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.
 - e. TCI Products.
 - f. TRUEBRO, Inc.

- g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.
 - 3. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
 - 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:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TRUEBRO, Inc.
 - 3. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.6 FIXTURE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Josam Company.
 - 2. MIFAB Manufacturing Inc.
 - 3. Smith, Jay R. Mfg. Co.
 - 4. Tyler Pipe; Wade Div.
 - 5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
 - 6. Zurn Plumbing Products Group; Specification Drainage Operation.
- C. Water-Closet Supports:
 - 1. Description: Combination carrier designed for accessible mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
- D. Urinal Supports:
 - 1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
 - 2. Accessible-Fixture Support: Include rectangular steel uprights.

E. Lavatory Supports:

1. Description: Type I, lavatory carrier with exposed arms and tie rods for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

F. Sink Supports:

1. Description: Type I, sink carrier with exposed arms and tie rods for sink-type fixture. Include steel uprights with feet.

2.7 INTERCEPTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Schier
6. Zurn Plumbing Products Group; Specification Drainage Operation.
7. Park Enviromental.

2.8 WATER CLOSETS

A. Water Closets

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
 - b. Kohler Co.
 - c. Zurn Industries.
4. Description: Accessible, wall-hung.
 - a. Style: two piece.
 - 1) Bowl Type: Elongated design. Include bolt caps matching fixture.

- 2) Height: Accessible.
- 3) Design Consumption: 1.28 gal./flush unless scheduled otherwise.
- 4) Trip Mechanism: Lever-handle actuator (left or right hand as required).
- 5) Color: White.
- b. Supply: NPS 1/2" chrome-plated brass or copper with wheel-handle stop.
- c. Style: Flush tank.
 - 1) Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
 - 2) Height: Accessible.
 - 3) Design Consumption: 1.28 gal./flush.
 - 4) Color: White
- d. Toilet Seat: as scheduled

2.9 LAVATORIES

A. Lavatories

- 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:
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Bradley Verge
 - b. Eljer
 - c. American Standard Companies, Inc.
- 4. Description: Accessible, wall-mounting, vitreous-china fixture.
 - a. Type: With back.
 - b. Size: 18 by 15 inches rectangular.
 - c. Faucet Hole Punching: Three holes, 2-inch centers.
 - d. Faucet Hole Location: Top.
 - e. Pedestal: Not required.
 - f. Color: Reference interior design color schedule.
 - g. Faucet: Lavatory with 0.5 gpm flow.
 - h. Supplies: NPS 3/8 chrome-plated copper with stops.
 - i. Drain: Grid.
 - 1) Location: Near back of bowl.
 - j. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated, cast-brass P-trap; NPS 1-1/2, 0.032-inch-thick tubular brass waste to wall; and wall escutcheon.
 - k. Drain Piping: Schedule 40 ABS or PVC, NPS 1-1/4 by NPS 1-1/2 P-trap; NPS 1-1/2, tubular waste to wall; and wall escutcheon.

B. Lavatories

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Kohler Co.
 - b. American Standard Companies, Inc.
4. Description: Counter-mounted, vitreous-china fixture.
 - a. Type: Self-rimming.
 - b. Rectangular Lavatory Size: 8 by 15 inches.
 - c. Oval Lavatory Size: 19 by 16 inches.
 - d. Faucet Hole Punching: Three holes, 2-inch centers.
 - e. Faucet Hole Location: Top.
 - f. Color: White.
 - g. Faucet: Lavatory with 0.5 gpm flow.
 - h. Supplies: NPS 3/8 chrome-plated copper with stops.
 - i. Drain: Grid.
 - 1) Location: Near back of bowl.
 - j. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated, cast-brass P-trap; NPS 1-1/2, thick tubular brass waste to wall; and wall escutcheon.
 - k. Drain Piping: Schedule 40 ABS or PVC, NPS 1-1/2, tubular waste to wall; and wall escutcheon.

2.10 KITCHEN SINKS

A. Kitchen Sink:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Kohler Co.
 - b. American Standard Companies, Inc.
 - c. Elkay Manufacturing Co.
 - d. Just Manufacturing Company.
4. Description: Reference drawings

2.11 SERVICE BASINS

A. Service Basins:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Florestone Products Co., Inc.
 - b. Precast Terrazzo Enterprises, Inc.
 - c. Stern-Williams Co., Inc.
 - d. Crane Plumbing, L.L.C./Fiat Products.
 - e. Mustee, E. L. & Sons, Inc.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
4. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.
 - a. Shape: Square.
 - b. Size: 24 by 24 inches.
 - c. Height: 6 inches with dropped front.
 - d. Tiling Flange: Not required.
 - e. Rim Guard: On front top surfaces.
 - f. Color: Not applicable
 - g. Faucet: as scheduled.
 - h. Drain: Grid with NPS 2 outlet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install wall-mounting fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- J. Install toilet seats on water closets.
- K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- L. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- M. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install traps on fixture outlets.
1. Exception: Omit trap on fixtures with integral traps.
 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- O. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- P. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at faucets to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.
- E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

Section 23 05 00 – HVAC scope

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 HVAC WORK

- A. These specifications are issued to cover all work in connection with the complete installation of the HVAC work. HVAC work is hereby defined to include work as herein specified and as shown on the drawings issued in connection with this project. Any reference in the Division 23 Specification Sections to the Contractor shall hereby be considered a reference to the HVAC Contractor (BP21). Any reference or letting of work to subcontractors or manufacturers in these specifications does not relieve the Contractor of his responsibility for the Work, materials, and equipment under this contract.

1.3 CUTTING AND PATCHING

- A. The Contractor shall do all cutting and patching for the installation of new ductwork and equipment in the building.
- B. Wherever it becomes necessary to cut out any portions of walls, floors, ceilings, or other portions of the building as may be required to perform the work under this contract, the Contractor shall do all necessary cutting and fitting, shall remove all excess material, and shall replace all damaged work so as to leave the premises in a finished condition. No cutting shall be done which may in any way affect the building structurally or architecturally without first securing the consent and approval of the professional. Any damage incident to cutting or other causes in the performance of this contract shall be made good by replacement or repairs in a manner satisfactory to the professional. The Contractor must use extra precaution so as not to disturb the bearing quality of construction.
- C. All patching and repairing shall be done by workmen skilled in this type of work and shall match present or new finishes.
- D. All cutting performed under this contract shall be done in a neat and workmanlike manner. The size of each new opening shall be kept to minimum size. The location of each new opening must be approved by the professional before the opening is drilled or cut.

1.4 SCAFFOLDING AND RIGGING

- A. This Contractor shall provide all the scaffolding required to do the work included in this contract. All necessary precautions must be taken in high risk areas. Provide temporary rigging, as required, to install new work.

1.5 HVAC PLANS

- A. The HVAC plans are intended to be diagrammatic and are based on one (1) manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions or all the details of the equipment. The Contractor shall verify the actual dimensions of all materials and equipment to ensure that they will fit in the available space. All apparatus shall be located and all ductwork run in the manner and locations shown thereon as closely as conditions will permit, and deviations therefrom shall be made only with the consent of the professional and without additional charge. The right is reserved by the professional to make any reasonable changes in the location of the equipment and ductwork prior to rough-in without involving additional expense.
- B. Due to the magnitude of ductwork and the limited amount of overhead and ceiling space, installation of ductwork shall have precedence over other trades. Installation of systems under his designated contract shall be coordinated with all other contractors. HVAC Contractor shall provide "Interference Drawings" to be coordinated with all other contractors. HVAC Contractor shall submit 5 sets of prints for review by the engineer no ductwork shall be installed until "Interference Drawings" are reviewed by engineer.

1.6 STANDARD OF QUALITY

- A. All material shall be strictly in accordance with the quality, style and size as specified herein. Manufacturers names and model numbers are given in the specifications for the purpose of establishing a standard of quality, style, size and type, and shall not be construed to exclude equipment or material of other manufacturers.
- B. When the Contractor elects to substitute materials or equipment other than that specified, the Contractor will be held responsible for all structural, mechanical, and electrical changes required for the installation of substituted materials or equipment at no additional cost to the Owner. All changes shall be subject to architectural, mechanical, electrical and structural professionals' complete approvals.
- C. When the Contractor desires to furnish equipment of another manufacturer, he shall include a complete specification of the substituted item with each submission copy of shop drawings indicating the necessary modifications to his standard product to satisfy the requirements of the contract specifications.
- D. Final approval of competitive equipment is reserved by the professional when in their opinion the equipment does not correspond to that specified.

1.7 SHOP DRAWINGS AND SUBMITTALS

- A. Prior to starting any installation, submit ten (8) copies of shop drawings of items proposed for this work with all necessary illustrations, drawings, and engineering data for review by the professional. Submit in time to allow no less than 15 working days for checking and transmittal without delaying the construction schedule. Submit all items no more than 30 days after award of the contract.

- B. The work described in any shop drawing submission shall be carefully checked for all clearances, field conditions, maintenance of architectural conditions and proper coordination with all trades on the job. Each submitted shop drawing shall include a certification that all related job conditions have been checked and that no conflict exists.
- C. Shop drawing submittals shall be clearly marked to show the intended item with identification as to unit number or other marking to show location, service, and function. Submittals not marked to identify the equipment and application will be rejected.
- D. Prior to submitting each shop drawing, the Contractor shall review said shop drawing for compliance with the Contract Documents. The Contractor's stamp and signature shall indicate his approval. Any and all deviations from the Contract Documents and/or modifications necessary to the equipment being submitted shall be identified on each shop drawing.
- E. The submissions are the Contractor's documents and the professional's approval constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.
- F. The equipment supplier, by submitting, certifies that the materials or equipment proposed is satisfactory for the application intended, including adverse conditions that may prevail at the job site and that materials and equipment are in current production with no known plans to cease production.
- G. The Contractor agrees that submittals processed by the professional are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the professional that the Contractor understands the design concept; and that this understanding is demonstrated by indicating which equipment and materials he or she intends to furnish and install and the fabrication and installation method that he or she intends to use.
- H. The Contractor further agrees that if deviations, discrepancies or conflicts between submittals and Contract Documents are discovered either prior to or after submittals are processed by the professional; the Contract Documents shall control and shall be followed.
- I. Should the Contractor submit more than one substitution for any equipment or other material that is rejected by the professional, he will reimburse the professional for the time to review additional submittals.
- J. At the close of the job, prior to final review, three (3) bound copies of the following shall be submitted by transmittal to the professional for review and acceptance.
 - 1. Equipment warranties.
 - 2. Contractors' warranties.
 - 3. Parts list and manuals for all equipment.
 - 4. Operating instructions (in writing).
 - 5. Written instructions on maintenance and care of the systems.

- K. Submit shop drawings and manufacturer's data for the following items in accordance with the Contract Documents:
 - 1. Hangers, supports, inserts, expansion compensators, flexible connectors.
 - 2. Thermal insulation.
 - 3. Grilles, registers, diffusers, dampers and air distribution system accessories.
 - 4. Exhaust fans.
 - 5. Automatic temperature control equipment, wiring diagrams, component descriptions and sequences.
 - 6. Access panels.
 - 7. Fireproofing materials.
 - 8. Electric wall heaters and electric cabinet heaters
 - 9. DX - rooftop units.
- L. The submissions are the Contractor's documents, and the professional's approval constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.

1.8 VIBRATION AND NOISE CONTROL

- A. All equipment shall operate without objectionable noise or vibrations within noise criteria curves listed in sound and vibration control fundamentals of the latest edition of the 2003 ASHRAE Handbook of Systems and Applications. Sound and vibration measurements shall conform with the ASHRAE Handbook of Fundamentals. If such objectionable noise or vibration shall be produced and transmitted to occupied portions of the building by apparatus, piping, ducts or other parts of this work, any necessary changes, as approved, shall be made without cost to the Owner. Noise levels shall conform with the requirements of OSHA.
- B. All mechanical equipment shall be isolated in accordance with the 2003 ASHRAE Guide and Data Book HVAC Systems and Applications. All vibration isolators shall be of the same manufacturer where possible and shall be furnished by Consolidated Kinetics, Korfund, Vibration Eliminator Co. or approved equivalent.

1.9 DUST, DIRT, AND NOISE

- A. The Contractor shall do all cutting and patching and shall make all changes, relocations, and installations with a minimum of noise.
- B. All present and new equipment, floors, walls, etc., shall be adequately protected from dust and dirt caused by the work. Protection shall include suitable temporary barriers or coverings. The exterior and interior premises of the building shall be kept as clean as possible during

construction. At no time shall the Contractor interfere with the normal operation of the building by allowing debris, etc., to remain on the premises. Contractor shall use industrial type vacuum cleaners for removal of plaster, dust, etc. In the building.

1.10 EQUIPMENT GUARDS

- A. Equipment guards shall be provided for protection at all belts, chains, gears, or other moving parts of equipment and machinery installed under this contract. Guards shall be made up of suitable structural shapes and heavy gauge steel welded together and attached to equipment by removable clips and bolts. Guards shall be neat and substantial and shall be securely attached to equipment. After fabrication, guards shall be cleaned of rust and scale and painted with one coat of metal primer followed by two coats of enamel to match the equipment. Guards shall be easily removable for maintenance and service of equipment. All equipment guards shall conform with OSHA requirements.

1.11 PAINTING

- A. The HVAC Contractor shall furnish all labor, materials, tools, and other equipment necessary for all painting hereinafter specified. All painting shall be done by workmen skilled in this type of work. Painting shall be in strict accordance with the requirements and recommendations of OSHA.
- B. All nongalvanized and unpainted iron and steel work installed above ceilings and gas piping exposed outdoors installed under this contract shall be painted with two coats of rust-oleum rust preventative paint. First coat shall be rust-oleum no. X-60 red primer and second coat shall be Rust-Oleum No. 634 Black Gloss. All galvanized and nongalvanized iron and steel work installed at locations at the exterior of the building shall be painted similar to the above, except finish coats shall be of colors selected by the professional. Galvanized surfaces shall be given a special primer.
- C. Prior to painting gas piping, remove rust, dirt, and grease.
- D. Paint interiors of metal ducts for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 Painting Section.
- E. Where the factory finish on equipment has been damaged, the equipment shall be refinished to the satisfaction of the professional.
- F. All painting shall be done in a careful, neat and workmanlike manner with particular care being exercised to protect building equipment and finishes. All surfaces shall be thoroughly cleaned of rust, scale, dirt, grease, dust, and like items, and sanded so as to provide bond for new paint. The Contractor shall be entirely responsible for cleaning all surfaces and should evidence appear to the professional that the surface was not properly prepared, the Contractor shall remove paint, prepare surface and repaint as required at no additional cost.

1.12 MISCELLANEOUS IRON WORK

- A. Furnish and install all miscellaneous iron work including, but not limited to, ductwork supports, rooftop unit support, exhaust fan support all lintels not shown on structural drawings, and all other equipment supports. All additional structural members shall be furnished and installed to support the heating, ventilating and air conditioning equipment without excessive stress or strain on the building construction. Structural beams and other structural members shall be furnished and installed under this contract where the building steel is not available or capable of supporting or anchoring ductwork and equipment. Nothing shall be hung from the deck.
 - B. All equipment and materials furnished and installed under this contract which are not mounted on bases or floors shall be securely attached and supported from the main supporting structure of the building by metal hangers, clamps and/or brackets. Metal hangers, clamps and/or brackets shall be of suitable design and of sufficient strength to properly and safely support the materials and equipment involved. Lag screws and bolts shall be used where required at wood construction.
 - C. Materials
 - 1. Structural steel members for the support of equipment installed under this contract shall conform to ASTM Specifications A-36 and shall comply with the latest requirements of the American Institute of Steel Construction. Structural steel shall be of standard sections as given in the structural steel manufacturers' handbooks.
 - D. Priming
 - 1. All steel and iron work shall be primed with Rust-Oleum X-60, or approved equivalent. Before priming all metal shall be thoroughly cleaned free from scale, rust, and dirt.
 - E. Anchors
 - 1. The Contractor shall provide all anchors, bolts, screws, dowels, and connecting members and do all cutting and fitting necessary to secure the work to adjoining construction. Build in connecting members to masonry, concrete, and structural steel as the new and remodeling work progresses.
 - F. Supports and brackets
 - 1. Supports and brackets shall be neatly constructed of structural shapes to adequately support the equipment intended. All supports must be approved prior to installation. Field conditions will regulate the type of support.
- 1.13 FLASHINGS
- A. The Contractor shall furnish and install roof curbs as required for his equipment.
 - B. Flashings at roof ventilator curbs will be furnished and installed by the Roofing Contractor (BP10).
- 1.14 OPENINGS IN WALLS AND ROOF

- A. The Contractor shall furnish openings for roof openings for ductwork, piping, and conduit serving the rooftop units and exhaust fans.

1.15 ELECTRIC MOTORS, STARTERS AND SELECTOR SWITCHES

- A. Electric motors

- 1. All electrical motors furnished and installed under this contract shall be manufactured by Reliance, General Electric, U.S. Motors, or approved equivalent and shall be of the proper type and frame of the services involved in accordance with the NEMA and equipment manufacturer's recommendations. Motors shall be "Energy Efficiency" type with 1.15 service factor. Motor windings shall be all copper. Where possible, motors shall be permanently lubricated. Where motors must be lubricated, the manufacturer shall furnish the services of a representative to review the lubrication procedure with the Contractor and the Owner and turn over to both of them all of the necessary maintenance literature. Motors and installation shall conform with all applicable requirements of the National Electrical Code. Motors shall be suitable for across-the-line or reduced voltage starting as applicable in each instance. The Contractor shall properly size overcurrent protection devices for all combination starters and disconnect switches. The Contractor shall be responsible for any additional costs to the Electrical Contractor (BP22) resulting from any changes in motor sizes initiated by the Contractor, from sizes scheduled on the drawings.

- B. Manual motor starters

- 1. Manual motor starters shall be furnished by the Contractor to the Electrical Contractor (BP22) for installation, for single phase fractional horsepower (1/2 horsepower and smaller) motors. The manual motor starter overload devices shall be sized for the loads served.

- C. Magnetic motor starters - full voltage

- 1. Furnish to the Electrical Contractor (BP22) for installation combination full voltage magnetic starters and fused disconnect switches for all 3 phase motors with service factors of 1.15. Starters shall have three (3) current overload relays and low-voltage release. Starters shall be furnished with hand-off-automatic switch, red run light, overload reset, a set of extra auxiliary contacts consisting of one (1) normally open and one (1) normally closed contacts and a control transformer with 120 volt fused secondary control circuit and fused primary circuit. Starter enclosure shall be NEMA 1 enclosures. Furnish allen-bradley bulletin 512 starters or equivalent as manufactured by square d, general electric or siemens. Disconnect switches shall be horsepower rated to match the horsepower of the motors plus 1.15 service factors connected thereto as required. Fuses shall be furnished and delivered to the Electrical Contractor for installation, of type herein specified.
 - 2. Where starters are separately mounted, they shall be of the magnetic type as herein specified.

3. All magnetic motor starters for motors connected to the normal/emergency electrical distribution system shall be provided with an adjustable time delay unit. Time delay unit shall be capable of delaying motor starting from 0 to 180 seconds.

1.16 SAFETY SWITCHES

A. Safety switches shall be furnished to the Electrical Contractor (bp22) for installation.

1. Safety switches shall be of the fusible or non-fusible type as indicated, quick-make, quick-break in NEMA Type 1 sheet steel enclosure unless otherwise noted. Switches shall be horsepower rated, and of size and number of poles as indicated on the drawings. Safety switches shall be of type having a direct mechanical linkage between contacts and operating handle. Safety switches shall be as manufactured by Cutler-Hammer, General Electric, or Square D Company. Fuses for all switches shall be of the UI Class RKI low peak as manufactured by the Bussmann Mfg. Division of The McGraw-Edison Company. Fuses for motors shall be sized to conform with the motor running current and in strict accordance with the recommendations of the fuse manufacturer.
2. Where switches are located at the exterior of the building or in wet locations, they shall be provided with NEMA 3R or 4 weather tight and weather resistant enclosures. Enclosures for switches located in hazardous areas shall be of the appropriate explosion proof type.
3. Switches used as service entrance switches shall be Underwriters Laboratories listed suitable for service entrance equipment.

B. Fuses

1. The Contractor shall furnish to the Electrical Contractor (BP22) for installation all fuses required for HVAC work, including each and every fusible switch installed under this project.
2. Fuses shall be of the ampere ratings indicated on the drawings and/or as required by the National Electrical Code and shall have a voltage rating equal to or greater than, the voltage at their point of application.
3. All fuses, for use in systems rated 600 volts or less, shall be of the same manufacturer to facilitate positive selective coordination of the protective devices.
4. Fuses shall be stored in a moisture-free location and shall be installed in the fuse holders immediately prior to energization of the circuit in which the fuse is applied. In no case are fuses to be installed and shipped with equipment to assure compliance with the requirements for moisture-free storage.
5. Furnish one (1) spare set of three (3) fuses for each specific size of fuses installed. These spare fuses shall be delivered to the Owner at the time of acceptance of the project neatly encased in suitable lockable, hinged door, shelved, code gauge enameled metal cabinet as approved by the professional, for mounting near points of use. The Contractor shall obtain three copies of a signed receipt for fuses from the Owner and shall deliver one copy to the Owner and shall retain one copy for his file.

6. Fuses for all safety switches and switches in switchboards shall be Class RKI rejection type current limiting with ampere ratings of 1/10 ampere for 600 amperes, shall be of a dual-element time delay construction, incorporating a spring assisted thermal overload element using a 280 degree F. Melting point alloy to provide thermal protection for the fuse and fuse holder and a separate short-circuit element. The design shall provide time-delay of not less than 10 seconds at 500% of ampere rating. The interrupting rating shall be 200,000 amperes rms symmetrical as listed by Underwriters Laboratories. Short circuit element shall be designed to limit peak let-through current (IP) and energy let-through values (I²T) to 80% of the values established by Underwriters Laboratories standard for Class RKI fuses. Fuses shall be Bussmann Manufacturing Division of McGraw Edison Company "Low Peak" Type "LPN-RK" 250 volt.
7. Fuses for switches with current rating above 600 amperes shall be furnished with Bussmann Hi-Cap KRP-C (unless otherwise specified elsewhere) current limiting time delay dual element fuses of size shown. Short circuit element shall be pure silver. Fuses shall have an interrupting rating of 200,000 rms symmetrical amperes at 480 volts or less. Fuses shall have UL listing for the specified interrupting capacity. Fuses shall be properly coordinated with the switch furnished and shall be as manufactured by the Bussmann Division of McGraw-Edison Co.
8. Time delay current limiting fuses of another manufacturer may be considered for approval provided comparable charts are submitted showing Bussmann fuse curves and the substituted manufacturer's comparable curves on the same chart. A separate chart shall be submitted for each fuse size. The charts shall designate the comparable total clearing time-current characteristic curves, and separate charts shall designate the instantaneous peak let-through current in symmetrical rms amperes. Substituted fuses must be equal to or better than the Bussmann fuses herein specified.
9. Curves shall conform to the fuse manufacturer's published test data.
10. Bussmann coordination or selectivity charts have been used to design the subject project. When an approved manufacturer other than bussmann is accepted on the project and will furnish the fuses, the approved manufacturer will be responsible for providing selectivity and coordination data, to the professional for review and approval, which will assure that the fuses selected are coordinated throughout the project.

1.17 ACCESS PANELS

- A. The HVAC Contractor shall furnish factory-fabricated access panels for access to all concealed dampers, valves, and other equipment where no other means of access is available. Access panels shall be of appropriate size but not less than 12" flush type, hinged to drop down and out, screwdriver-operated, stainless steel in tile work and prime coated sheet steel in plaster or acoustical tile of all types. The Contractor shall deliver access panels to the General Carpentry Contractor (BP13) for installation in new construction. Exact locations and sizes of panels shall be determined by the Contractor, but panels shall be located for a symmetrical appearance. Access panels are not required at lift-out removable tile ceilings.

1.18 EQUIPMENT IDENTIFICATION

- A. Where valves, cleanouts, dampers, etc., are located above removable tile ceilings or above access panels the Contractor shall furnish and install identification labels on the corners of the access panels or removable ceiling tiles. Labels shall be provided with the word "valves," "relay," "damper," etc., so that the equipment may be readily located in the future.
- B. Identification labels shall not exceed 3" in length and 1" in height. Black letters shall be 1/4" high on white background. Labels shall be manufactured of engraved micarta or bakelite with pressure-sensitive backing and shall be nonabsorbent, nonporous and colorfast. Adhesive backing shall be chemically compounded to hold tight and fast at wide temperature extremes. Labels shall be as manufactured by Seton Name Plate Company, Brady Co., Kimball Systems, or approved equivalent. Labels shall be additionally secured with screws or rivets. Flexible plastic punched tapes will not be acceptable. Labels shall be coordinated with those being installed under other contracts.
- C. All major pieces of HVAC equipment shall include, at a suitable and accessible observation point on the equipment, a manufacturer's stamped brass or aluminum identification plate, with all pertinent capacity data stamped on the plate. Identification plate shall include all specific data, such as model number, serial number, motor data, horsepower, capacities, sizes, amperes, power consumption, speed, temperatures, working pressures, operating pressures, and similar factors as applicable. In addition, pumps shall include total head in feet and impeller sizes.
- D. The Contractor shall be responsible for furnishing and attaching an identification plate for the above mentioned major equipment if not provided by the equipment manufacturer.
- E. Equipment marking tags shall be engraved phenolic, 1/16" thick, four edges banded, black with white lettering. The tag shall be securely mounted to the equipment with minimum of two (2) - 3/8" long no. 3 screws. Tags shall provide such information as: "exhaust fan -EF1, "rooftop unit - RTU-1" and include "Date Of Installation and Project Number".
- F. The installations will not be considered acceptable unless identification plates and nameplates are attached.

1.19 CLEANING

- A. At the completion of the work all parts of the installation shall be thoroughly cleaned. All temporary replaceable air filters shall be removed and new replaceable air filters shall be installed after the areas have been cleaned for occupancy.
- B. Any stoppage or any discoloration or other damage to any part of the building, its finish or furnishings due to the Contractor's failure to properly clean shall be repaired by the Contractor without cost to the Owner.
- C. All new equipment installed under this contract, and new furnishings and finishes soiled or damaged due to the work included under this contract shall be thoroughly cleaned as required to remove plaster, dust, paint splashes, labels and debris.

1.20 INSTRUCTIONS TO OPERATING PERSONNEL

- A. The Contractor and his subcontractors shall satisfactorily complete the systems so that they are functional and operating to the satisfaction of the professional. All systems, their controls and their sequencing must be demonstrated to the satisfaction of the professional.
- B. The Contractor shall furnish the services of qualified personnel, approved by the professional and thoroughly familiar with the completed installation to instruct the permanent operating personnel in the proper operation of all systems included under this contract and the proper care of all equipment and apparatus. These services shall be furnished for a period of one 8-hour day after the operation of the building has been taken over by the Owner.
- C. When instructions are provided under this contract, the Contractor shall have in his possession three copies of an identifying letter which shall list the names of the Contractor's qualified instruction personnel including manufacturers' representatives and subcontractors that will be giving instructions. Likewise on the same letter, spaces shall be provided for the Owner's personnel who will receive the instructions. After instructions have been given and received for each system, the Contractor's representatives and subcontractors shall sign and date the letter, and the Owner's personnel shall sign and date the letter acknowledging that they have received adequate instructions for operating and maintaining the systems and equipment. One signed copy shall be delivered to the Owner, one copy to the professional, and one copy shall be retained by the Contractor.
- D. In addition to the verbal instructions outlined above, the Contractor and his manufacturers' representatives and subcontractors shall furnish written basic instructions indicating the proper operation of each system and associated equipment. Each manufacturer shall also submit a brochure on his equipment including instructions on operation, lubrication, recommended spare parts, and instructions on preventative, routine, and breakdown maintenance. All brochures and formats must be approved by the professional.
- E. The Contractor shall combine the written instructions and the manufacturers' equipment brochures in complete volumes with hard back binders which shall be turned over to the Owner before final acceptance of the contract work. The Contractor shall furnish the Owner with three (3) complete sets of the manuals indexed by equipment and by manufacturer. The Contractor shall obtain two copies of a signed receipt from the Owner for the written instructions and equipment brochures. One copy of the receipt shall be delivered to the professional and one copy retained by the Contractor.
- F. It is the intent that this entire system with its complement of equipment and auxiliary equipment operate properly in accordance with the design concept and functional intent. It is also the intent that the Owner be given complete instructions for the proper operation and maintenance of the entire system.

1.21 UTILITIES

- A. Do not interrupt any utility or service without adequate previous notice and schedule.
- B. The Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or services (underground, overground, interior or exterior) damaged, broken or otherwise rendered inoperative during the course of construction.

1.22 RECORD DRAWINGS

- A. Upon completion of this project, the Contractor shall furnish one (1) set of record drawings of the complete installation of this project on mylar tracing paper. Record drawings, all of which shall be dimensioned, shall be to the scale of one-eighth (1/8") inch or one-fourth (1/4") inch being equivalent to one (1') foot zero (0") inches. This project shall not be considered complete until record drawings have been submitted.

1.23 GUARANTEES

- A. All equipment, materials, and workmanship shall be guaranteed for a period of one (1) year, beginning with the date of acceptance of the project in writing. Special warranties will be called for under some sections of equipment. This warranty shall be in writing and shall include written copies of factory warranties and expiration dates on items of equipment where the warranty date might differ from the acceptance date, such as five (5) year warranty of sealed refrigerant systems. No warranty shall start before the acceptance date.
- B. The contractors' warranty shall include at least two (2) inspections of the system to repair and replace any items found to be defective during this period. The first shall be approximately six (6) months after the acceptance of the system and the second at the end of the first year.

PART 2 - PRODUCTS

2.1 NOT APPLICABLE

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work shall be performed by competent mechanics using proper tools and equipment to produce first-quality work. All work shall be neatly installed, accessible for maintenance, and complete with all accessories required.

3.2 ACCESSIBILITY

- A. All equipment shall be installed in such a way that all components requiring access control operators, motors, drives, belts) are so located and installed that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. If any equipment or components are shown in such a position that this Contractor cannot comply with the above, the Contractor shall notify the professional.

3.3 ROOF CURBS

- A. The Contractor shall furnish and install full perimeter roof curbs for all roof-mounted equipment. Unless shown otherwise, all duct connections to roof-mounted equipment shall be

within the perimeter of the curb. This Contractor shall provide six (6") inch blanket insulation inside the perimeter area of each roof curb to prevent sound transmission from fan and compressor noise. All equipment is to be supported from structural members. No weight shall be placed on the roofing materials or insulation or on metal decking. All curbs and rails shall be installed in accordance with the equipment manufacturers' recommendations for that particular roof type. Roof curbs for equipment mounting shall structurally support the intended equipment and span the necessary building structural members. Additional support shall be provided for the roof decking under the equipment mounting curb. All units must be set level. Roof-mounted equipment curbs must be provided with properly designed and fabricated leveling shims so the equipment is level and curb installation matches the roof slopes.

3.4 CODES AND STANDARDS

- A. All material and workmanship shall comply with all applicable codes, federal and state laws, specifications, local ordinances, industry standards and utility company regulations. In case of a difference between codes, specifications, federal and state laws, local ordinances, industry standards, and utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the professional in writing of any such difference.
- B. Reference to the following codes shall mean:

<u>REFERENCE</u>	<u>DEFINITION</u>
ASTM	American Society for Testing Materials
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electric Manufacturers Association
ANSI	American National Standards Institute
IBC	International Building Code
IMC	International Mechanical Code
L&I	Department of Labor and Industry

- C. Should the Contractor perform any work that does not comply within the requirements of the applicable building codes, state laws and federal laws, local ordinances, industry standards, and utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- D. This Contractor is assumed to be skilled in the trade and is solely responsible for compliance with OSHA regulations, performing the work in a safe and competent manner, and in installation procedures required for this work. All supervision assigned to this project shall be experienced in this type of work. This contractors' superintendent shall be designated as safety inspector, unless the Contractor designates another person and notifies the professional of this change.

3.5 POWER WIRING FOR MECHANICAL EQUIPMENT

- A. All power wiring and connections for all mechanical equipment including motors, starters, controllers, and breakers will be furnished and installed by the Electrical Contractor.
- B. Control wiring for HVAC equipment shall be furnished and installed by the HVAC Contractor, unless noted otherwise on the Drawings. Refer to section 23 09 00.

3.6 PERMITS, TESTS AND INSPECTIONS

- A. The Contractor shall give all requisite notices, obtain and pay all deposits and fees, including connection fees, necessary for the installation, tests, and inspections of all work provided under this specification. All tests shall be conducted in the presence of the professional.

END OF SECTION 23 05 00

Section 23 05 93 – testing, adjusting, and balancing of HVAC system

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The scope of the work shall include the furnishing and complete installation of the equipment covered by this Section with all auxiliaries ready for Owners use.

PART 2 - PRODUCTS

2.1 INDEPENDENT TESTING AND BALANCING CONTRACTOR

- A. The testing and balancing of the systems shall be provided by the HVAC Contractor who shall employ an independent testing and balancing contractor certified with the National Environmental Balancing Bureau to perform all testing and balancing of the air and water system.

2.2 EVALUATION OF SYSTEMS

- A. The testing and balancing Contractor shall furnish all materials and equipment necessary to properly measure the air capacity of the systems, the electrical voltage and currents, fan speeds, static pressures, air velocities, refrigeration pressures, and all other readings normally necessary to evaluate the performance of a system, adjust the quantities to those called for, and test the systems.

2.3 SYSTEM PERFORMANCE

- A. This Contractor is responsible for the performance of the equipment and the system he or she installs. This Contractor cannot assume that the supplier will ship equipment adjusted to meet the job requirements.

2.4 EQUIPMENT OPERATION

- A. All equipment shall be checked for proper operation as soon as electrical power is available and upon approval of the professional. Any malfunction shall be reported to the manufacturer, and corrective action taken as soon as possible to prevent delay of the acceptance of the work.

2.5 EQUIPMENT PROBLEMS AND ADJUSTMENTS

- A. Required adjustments with mechanical equipment are to be expected, and it is this Contractors' responsibility to determine if there are any in the work and to correct them without causing delay of the job.

PART 3 - EXECUTION

3.1 INITIAL BALANCING - AIR SYSTEMS

- A. Before commencing balancing, verify that systems are complete and operable. Ensure the following:
 - 1. Equipment is operable and 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. Correct fan rotation.
 - 7. Fire and volume dampers are in place and open.
 - 8. Coil fins have been 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 has been minimized.
- B. As soon as electrical power is available, the Contractor shall check all equipment for electrical problems, check rotation of motors, read voltage and currents in each leg of each motor, heater, etc., and check the readings against the nameplate.
- C. Complete ductwork as soon as possible and operate the evaporator fans (with filter in place); adjust the units for maximum air supply by reading motor power. Supply outlets shall be adjusted to the required air quantity.
- D. The return air system shall then be adjusted to design capacity with the proper outside air.
- E. Check and balance each exhaust system to the design air quantity. Excess exhaust air will not be permitted.

- F. After supply and return air are in balance and the quantity correct, adjust the outside air dampers to the air quantity shown on the drawings (if not shown, use 10% of the supply air quantity). If economizer control is specified, check for proper setting of the controls and for proper operation of the dampers (outside air and relief).
- G. Report any defects or deficiencies noted during performance of services to Owner's representative.
- H. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- I. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- J. Beginning of Work means acceptance of existing conditions.

3.2 RESPONSIBILITY FOR PROPER BALANCING AND TESTING

- A. The Heating Ventilating and Air Conditioning Contractor is responsible for the performance of the entire building including the work in this section. After this Contractor has completed the installation, the superintendent for the heating ventilating and air conditioning Contractor shall monitor the balancing and testing of the systems, and shall certify that the readings required under this section have actually been made and that all systems are in actual operation. The test and balance report shall be certified by the independent testing and balancing contractor and signed by the general superintendent. At the time of final review, if it is suspected that these readings have not been made or that equipment is not in operation, the expense for the return of the professional and/or professional shall be billed to the Heating Ventilating and Air Conditioning Contractor.

3.3 READINGS REQUIRED TO BE REPORTED

- A. The following readings shall be made and reported to the professional.
- B. All readings shall be submitted in a testing, adjusting and balancing report certified by the national environmental balancing bureau. All readings shall give the actual raw data read for each supply and return opening, including exhaust hoods and openings. All readings made shall be recorded, and if any readings are invalid, they shall be identified as such. Any readings out of line shall be explained by a note in the report. Six (6) copies of the report shall be submitted to the professional for review.
- C. Air quantity readings shall include:
 - 1. Actual measured air quantity of each supply and return outlet shall be read and recorded. Measurements shall be made with a cone with a calibrated outlet and velometer equivalent to alnor.
 - 2. Same for each return and exhaust inlet.
- D. Temperature readings required as above are:
 - 1. Outside air at equipment.

2. Return air at unit.
3. Supply air leaving unit.
4. Mixture of outside and return air before entering the cooling or heating coil or heater.

E. Electrical readings required are:

1. Measured voltage and amps on each phase of each major motor (compressor, evaporator fan, condenser fans, roof exhaust fans, etc.) While the equipment is under maximum normal load.
2. The nameplate voltage and current for each of the above motors.

F. Refrigeration readings required are:

1. Suction and discharge pressure of each compressor, or in the case of packaged condensing units, the suction and liquid line pressures.

3.4 SYSTEM DIFFICULTIES

- A. The above readings shall be made on each unit or piece of equipment and these readings sent to the professional for review as early as possible so that any apparent difficulties can be resolved before the anticipated close of the job.

3.5 REVIEW BY PROFESSIONAL

- A. After the above information is received by the professional, it will be reviewed and compared against the design. The professional will generally review the job for the Owner. Such review will not be scheduled until the above information can be reviewed and accepted. The work required under this contract is not complete until this information is accepted as accurate and complete.

END OF SECTION 23 05 93

SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. Scope of the work shall include the furnishing and complete installation of the equipment covered by this section, with all auxiliaries, ready for the Owners' use.
- B. All (single wall) supply air ductwork shall be externally insulated.
- C. Exhaust air ductwork shall not be insulated.

1.3 CODE COMPLIANCE

- A. All duct insulation shall be fabricated and installed in accordance with the SMACNA Standards, NFPA 90A, IECC 2003, and all other applicable codes.

PART 2 - PRODUCTS

2.1 INSULATION AND ENCLOSURES

- A. General
 - 1. Furnish and install best grade insulation for all equipment, and sheet metal work as specified herein or as may be necessary for properly insulated heating and ventilating systems.
 - 2. Insulation shall be applied to clean, dry surfaces after ductwork and equipment have been tested and approved.
- B. Materials
 - 1. All insulation, jackets or facings and adhesives used to adhere jacket or facing to the insulation, including fittings and butt strips, shall have a fire and smoke hazard system rating and label as tested by ASTM E-84, NFPA 255 and UL 723 not exceeding flame spread 25, smoke developed 50. Accessories such as adhesives, mastics cements, tapes and cloth for fittings shall have the same ratings as listed above.

- a. Flexible Fiber Glass Blanket (External Insulation): Conforming to ASTM C 553, Type I, and HH-I-558B, Form B, Class 6.
- b. Thermal conductivity (k value) of at least .29 at 75 degrees F. Mean temperature.
- c. Vapor Barrier Jacket: Foil Scrim Kraft (FSK): Conforming to HH-B-100B, Type II and ASTM C 1136, Type II having a maximum vapor transmission rating of 0.02 perms. Secure in place using outward clinch staples and appropriate pressure sensitive foil tape or glass fabric and vapor barrier mastic.
- d. Installation: Maximum allowable compression is 25%.
- e. Density: 1-1/2" pcf (pounds per cubic foot)
- f. Supply/Return Air Ductwork (Single Wall): Insulate all single wall, supply air ductwork with 2" thick, 1-1/2" pcf external insulation ductwrap. Provide absolutely vapor proof exterior finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not use staples for securing any insulation.
- B. Apply insulation only on clean, dry surfaces.
- C. Continue insulation through wall and ceiling openings and sleeves, except terminate duct insulation at flexible duct connections at equipment.
- D. Insulate entire system, including fittings, joints, flanges, flexible connections, and expansion joints.

END OF SECTION 23 07 00

SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The scope of the work shall include the furnishing and complete installation of the equipment covered by this section with all auxiliaries ready for Owners use.

PART 2 - PRODUCTS

2.1 COMPLIANCE SUPPORT

- A. Services and Arrangements – General
 - 1. The contractor shall assist and cooperate with the Owner, Architect and consultants during project construction, testing and balancing and operation for those parts of the work relating to the scope of the Contractor as necessary to ensure that the objectives are attained.
 - 2. The contractor shall specifically assist and provide recommendation as described herein including analysis, monitoring and reporting to the Owner as required and approved by the Owner.
 - 3. Any project designs and operational arrangement changes recommended to the Owner by the Contractor during construction will be reviewed and may or may not be accepted by the Owner. If accepted they may be included in the project scope either directly in the contract documents or by separate agreement.

2.2 FIELD DEVICES

- A. Provide instrumentation as required for monitoring, control or optimization functions.
- B. Room temperature sensors shall be electronic
 - 1. Digital room sensors shall have setpoint slide adjustment override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.

- a. Temperature Monitoring Range: +20/120°F -13° to 49°C
 - b. Output Signal: Changing resistance
 - c. Accuracy at Calibration Point: +0.5°F (+/- 0.3°C)
 - d. Set Point And Display Range: 55° to 95° F (13° to 35°C)
2. Duct (Single Point) Temperature:
 - a. Temperature Monitoring Range: +20/120°F (-7°/49°C)
 - b. Output Signal: Changing resistance
 - c. Accuracy at Calibration Point: +0.5°F (+/-0.3°C)
3. Duct Average Temperature:
 - a. Temperature Monitoring Range: +20° +120°F(-7°/+49°C)
 - b. Output Signal: 4 – 20 MA DC
 - c. Accuracy At Calibration Point: +0.5°F (+03°C)
 - d. Sensor Probe Length : 25' 1 (7.3m)
4. Outside Air Temperature:
 - a. Temperature Monitoring Range: -58°+122° F(-50°C to +50°C)
 - b. Output Signal: 4 – 20 MA DC
 - c. Accuracy at Calibration Point: +0.5°F (+/-0.3°C)
5. Humidity Sensors:
 - a. Range: 0 to 100% RH
 - b. Sensing Element: Bulk polymer
 - c. Output Signal: 4 – 20 Ma Dc
 - d. Accuracy: at 77°F(25°C) + 2% RH

C. Damper actuators

1. Damper actuators shall be electronic fail safe spring return, all metal housing, manual override.
 - a. The actuator assembly shall include the necessary hardware and proper mounting and connection to a standard ½” diameter shaft or damper blade.
2. Actuators shall be designed for mounting directly to the damper shaft without the need for connecting linkages.
3. All actuators having more than 100 lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator's output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed “v” shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with the damper shaft.
4. All actuators having more than a 100 lb-in torque output shall accept a 1” diameter shaft directly, without the need for auxiliary adapters.
5. All actuators shall be designed and manufactured using ISO 900 registered procedures, and shall be listed under standards UL873 and CSA22.2 No. 24-93 L.

2.3 MISCELLANEOUS DEVICES

A. Thermostats/Thermidistats

1. Refer to Section 23 74 13 "Packaged, Outdoor, Central-Station Air-Handler Units" for thermostat/thermidistat serving the rooftop units.
2. For exhaust systems, thermostats shall be line voltage type, direct or reverse acting, as applicable.
3. Thermostats/thermidistats shall be arranged for either horizontal or vertical mounting.
4. In the vertical position thermostat/thermidistat shall fit on a mullion of movable partitions without overlap.
5. Mount the thermostat/thermidistat covers with tamper-proof socket head screws.

B. Current Sensing Relay:

1. Provide solid-state, adjustable, current operated relay. Provide a relay which changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.
2. Adjust the relay switch point so that the relay responds to motor operation under load as an "On" state and so that the relay responds to an unloaded running motor as an "Off" state. A motor with a broken belt is considered an unloaded motor.
3. Provide for status device for all fans.

C. Smoke Detector (For Unit Shutdown)

1. Return air smoke detector (furnished by BP-25 contractor, factory installed by this contractor) shall input a smoke alarm to the controller when products of combustion are sensed. When the alarm is received by the controller, it shall de-energize the rooftop unit. The controller shall close the outdoor air damper while opening the return damper

D. Humidistat

1. HVAC Contractor shall provide a digital humidistat for wall installation. The humidistat shall also have an integral field programmable transmitter for setting humidity levels between 20% to 80% relative humidity. The humidistat power connections shall be made in the low-voltage compartment of the unit control box.
2. Unit shall be rated for 2 % accuracy.
3. The humidistat manufactured by Veris Industries, or by Carrier.

PART 3 - EXECUTION

3.1 CONTROL WIRING

- A. Control wiring for HVAC equipment shall be furnished and installed by HVAC Contractor unless noted otherwise on the drawings.
- B. All control wiring shall be the responsibility of the HVAC Contractor who provides the particular equipment. Control wiring includes furnishing and installing all required motor controls, relays, all related raceway systems, all related conductors and all final connections, other than three phase power connections.

3.2 SEQUENCE OF OPERATION

- A. Rooftop units
 - 1. The rooftop units are constant volume, consisting of an economizer section (OA & RA dampers), direct expansion cooling, gas heating, factory installed controls.
 - 2. Refer to Section 23 74 13 for detailed sequence of operation of rooftop units.
- B. General exhaust fan controls
 - 1. A day/night/electric switch shall be provided for each general exhaust fan where indicated on the schedule which shall function to operate the exhaust fan continuously during the "Occupied" cycle of operation and stop the exhaust fan during the "Unoccupied" cycle of operation. All control wiring will be furnished and installed by the Contractor.

END OF SECTION 23 09 00

SECTION 23 23 00 - REFRIGERANT PIPING

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 refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
 - 6. Pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Shop Drawing Scale: 1/4 inch equals 1 foot (1:50).
 - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
- C. Welding certificates.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.
- B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

- C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.
- D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Flanged Unions:
 - 1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 (DN 25 to DN 40) and ductile iron for NPS 2 to NPS 3 (DN 50 to DN 80). Apply rust-resistant finish at factory.
 - 2. Gasket: Fiber asbestos free.
 - 3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
 - 4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
 - 5. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 6. Pressure Rating: Factory test at minimum 400 psig (2760 kPa).
 - 7. Maximum Operating Temperature: 330 deg F.
- F. Flexible Connectors:
 - 1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
 - 2. End Connections:
 - a. NPS 2 (DN 50) and Smaller: With threaded-end connections.
 - b. NPS 2-1/2 (DN 65) and Larger: With flanged-end connections.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig (3450 kPa).
 - 7. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze.
 - 2. Packing: Molded stem, back seating, and replaceable under pressure.
 - 3. Operator: Rising stem.
 - 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 - 5. Seal Cap: Forged-brass or valox hex cap.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Working Pressure Rating: 500 psig (3450 kPa).

8. Maximum Operating Temperature: 275 deg F.
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 3. Piston: Removable polytetrafluoroethylene seat.
 4. Closing Spring: Stainless steel.
 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 275 deg F.
- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig (3450 kPa).
- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 115 or 208-V ac coil.
 6. Working Pressure Rating: 400 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F.
 8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig (2760 kPa).
 6. Maximum Operating Temperature: 240 deg F.
- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig (4820 kPa).

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig (3450 kPa).
5. Maximum Operating Temperature: 275 deg F.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F.

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F.

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Designed for reverse flow (for heat-pump applications).
4. End Connections: Socket.
5. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
6. Maximum Pressure Loss: 2 psig (14 kPa).
7. Working Pressure Rating: 500 psig (3450 kPa).
8. Maximum Operating Temperature: 240 deg F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Designed for reverse flow (for heat-pump applications).
4. End Connections: Socket.
5. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
6. Maximum Pressure Loss: 2 psig (14 kPa).
7. Working Pressure Rating: 500 psig (3450 kPa).
8. Maximum Operating Temperature: 240 deg F.

M. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F.

N. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 275 deg F.

O. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Suction Lines NPS 3-1/2 (DN 90) and Smaller NPS 2 to NPS 3-1/2 (DN 50 to DN 90) for Conventional Air-Conditioning Applications: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with brazed joints.
- C. Suction Lines NPS 4 (DN 100) and Smaller for Conventional Air-Conditioning Applications: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with soldered joints.

- D. Safety-Relief-Valve Discharge Piping: Copper, Type L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
- E. Safety-Relief-Valve Discharge Piping: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
- F. Safety-Relief-Valve Discharge Piping: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
- G. Safety-Relief-Valve Discharge Piping: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- H. Safety-Relief-Valve Discharge Piping:
 - 1. NPS 5/8 (DN 18) and Smaller: Copper, Type L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 2. NPS 3/4 to NPS 1 (DN 20 to DN 25) and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 3. NPS 1-1/4 (DN 32) and Smaller: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
 - 4. NPS 1-1/2 to NPS 2 (DN 40 to DN 50): Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- I. Safety-Relief-Valve Discharge Piping NPS 2 to NPS 4 (DN 50 to DN 100): Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Hot-gas bypass valves.
 - 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.
- L. Install receivers sized to accommodate pump-down charge.
- M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.

- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
 - 1. Shot blast the interior of piping.
 - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
 - 3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 - 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 - 5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
 - 6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.
- R. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- S. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- T. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- U. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- V. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
- W. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 2. Use Type BA_g, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2 (DN 15): Maximum span, 60 inches; minimum rod size, 1/4 inch.
 2. NPS 5/8 (DN 18): Maximum span, 60 inches; minimum rod size, 1/4 inch.
 3. NPS 1 (DN 25): Maximum span, 72 inches; minimum rod size, 1/4 inch.
 4. NPS 1-1/4 (DN 32): Maximum span, 96 inches; minimum rod size, 3/8 inch.
 5. NPS 1-1/2 (DN 40): Maximum span, 96 inches; minimum rod size, 3/8 inch.
 6. NPS 2 (DN 50): Maximum span, 96 inches; minimum rod size, 3/8 inch.
 7. NPS 2-1/2 (DN 65): Maximum span, 108 inches; minimum rod size, 3/8 inch.
 8. NPS 3 (DN 80): Maximum span, 10 feet; minimum rod size, 3/8 inch.
 9. NPS 4 (DN 100): Maximum span, 12 feet; minimum rod size, 1/2 inch.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 2 (DN 50): Maximum span, 10 feet; minimum rod size, 3/8 inch.
 2. NPS 2-1/2 (DN 65): Maximum span, 11 feet; minimum rod size, 3/8 inch.
 3. NPS 3 (DN 80): Maximum span, 12 feet; minimum rod size, 3/8 inch.
 4. NPS 4 (DN 100): Maximum span, 14 feet; minimum rod size, 1/2 inch.
- E. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 - 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00

SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The ductwork shall be as hereinafter described in This Section.
- B. All ductwork shall be galvanized steel.

1.3 CODE COMPLIANCE

- A. All ductwork shall be fabricated and installed in accordance with the SMACNA Standards, NFPA 90A, NFPA 90B, and all other applicable codes for the pressure classification as noted on the drawings and in the schedule.

1.4 DUCT CONSTRUCTION

- A. Each duct system shall be constructed for two (2) inch W.G. pressure class.

PART 2 - PRODUCTS

2.1 LOW PRESSURE DUCTWORK - (GALVANIZED STEEL)

- A. All rectangular sheet metal duct shall be constructed as required in HVAC duct construction standards for low pressure ductwork as published by SMACNA. All rectangular ducts shall be complete with four (4) sides and shall be of airtight construction. All ducts, unless otherwise noted, shall be constructed of galvanized sheet steel or iron in accordance with the following table:

<u>WIDTH OF PANEL</u>	<u>SHEET THICKNESS - USS GAUGE NUMBER</u>
0" - 26"	24
27" - 40"	22

- B. Duct panels over twenty (20") inches in width shall be crossbroken or otherwise stiffened. Ducts shall be adequately braced in accordance with the following table:

<u>Width of Panel</u>	<u>Size of Angle – Inches</u>
0" - 18"	Standing Seams
19" - 36"	1" x 1" x 1/8"
37" - 54"	1 1/4" x 1 1/4" x 1/8"
55" and over	1 1/2" x 1 1/2" x 3/16"

- C. Concealed round sheet metal duct shall be constructed as required in HVAC duct construction standards for low pressure duct as published by SMACNA. Low pressure duct may be shop-fabricated, using good practice. Round sheet metal ducts shall be in accordance with the following table:

<u>Diameter</u>	<u>Spiral Seam Duct</u>	<u>Long Seam Duct</u>	<u>Fittings</u>
Up to 12"	28 gauge	26 gauge	26 gauge
13" - 18"	26 gauge	24 gauge	24 gauge

- D. Low pressure ductwork and fittings shall be made tight for minimum air leakage. Do not use snap lock type round ducts, adjustable elbows, dovetail or spin connections.
- E. Branch duct take-offs from rectangular ducts shall be full size bellmouth type (such as the buckley air-tite bellmouth take-off) with a heavy duty volume regulator for round branch ducts and 45° shoe tap type with volume regulator for rectangular branch ducts.
- F. Completely seal all joints at all duct junctions and all other joints with United McGill Duct Seal and according to SMACNA HVAC Construction Seal Class B.
- G. Duct tape shall not be used to seal joints, to make transitions or for any other reasons except on the outside of wrapped insulation. If duct tape is used on sheet metal, the job will be rejected.

2.2 CURVED ELBOWS

- A. Curved elbows shall have a throat radius equivalent to the duct width. Provide splitter vanes in radius elbows where indicated on the drawings.

2.3 SQUARE ELBOWS

- A. Square elbows shall have double-thickness turning vanes.

2.4 TRANSITIONS

- A. Transitions in ductwork shall be made with a slope not exceeding 1 - 5, preferably 1 - 7.

2.5 SUPPLY DUCT SPLITS

- A. Supply duct splits shall be provided with splitter dampers and adjustable locking quadrant. Splitter blade shall be 1.5 times the smaller split width.

2.6 DUCT SUPPORTS

- A. All ducts shall be adequately supported from construction above by means of strap iron hangers spaced at not more than six (6') foot intervals.
- B. Stiffeners shall be placed at not more than six (6') foot intervals.

2.7 DUCTMATE

- A. All joints between sheet metal sections may be made with prefabricated joining systems such as Ductmate Industries System. System shall consist of side rails complete with mastic sealer for the ends of a cleat to join the side rails, and the corner pieces. The side angles and cleats shall be made with not lighter than 20 gauge galvanized steel, corner pieces shall be fabricated of not lighter than 12 gauge galvanized steel. Completed assembly shall result in a zero percent (0%) leakage of air.

2.8 FLEXIBLE CONNECTIONS

- A. Flexible connections shall consist of a thickness of fabric fastened to both the air handling equipment and the duct in an air tight manner. Flexible connections shall provide not less than two (2") inch clearance between sheet metal. Flexible connections shall be UL approved, neoprene coated, 30 oz. Glass fiber fabric. Fabric shall be Ventglas made by Ventfabrics, Inc. or approved equivalent.

PART 3 - EXECUTION

1. DUCT INSTALLATION

- a. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- b. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- c. Install round ducts in maximum practical lengths.
- d. Install ducts with fewest possible joints.

- e. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- f. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- g. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- h. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- i. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- j. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- k. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- l. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

2. SEAM AND JOINT SEALING

- a. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.
- b. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

3. HANGER AND SUPPORT INSTALLATION

- a. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- b. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Powder-actuated fasteners shall not be used.
- c. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2,

"Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

- d. Hangers Exposed to View: Threaded rod and angle or channel supports.
- e. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- f. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. **Do not screw/fasten hangers to steel roof deck.**

4. CONNECTIONS

- a. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- b. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

5. DUCT SCHEDULE

- a. Fabricate ducts with galvanized sheet steel except as follows:
- b. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts: Galvanized steel.
 - 3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.
- c. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3,

"Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

- c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
- 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam .
- d. Branch Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. All velocities: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The duct accessories shall be as hereinafter described in this Section.

1.3 CODE COMPLIANCE

- A. All ductwork shall be fabricated and installed in accordance with the SMACNA Standards, NFPA 90A, NFPA 90b, and all other applicable codes.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

- A. Access doors shall be provided into all spaces between the several items of equipment where necessary to give access to pipes, dampers, valves, bearings or other equipment. Doors shall be large enough to allow for the proper service for which they are intended.
- B. All doors and frames shall be rigid and provided with permanently locked felt or sponged rubber seals. Fasteners are to suit conditions. Seams of doors shall not extend into the ducts. Access doors shall be "Ventlock" doors as made by Vent Fabrics, Inc. or equivalent as made by Air Balance, Inc.

2.2 ACCESS PANELS

- A. This Contractor shall furnish and install to the General Carpentry (BP13) Contractor for installation access panels for access to all concealed dampers (mechanical and gravity), and all other equipment where no other means of access is provided. All access panels shall be of sufficient size to service and remove the equipment for which they are provided and to open fully the access doors in ducts. In no case shall the clear opening be less than 24" x 24" unless restricted by space limitations.
- B. This Contractor shall determine in advance the location and sizes of all access panels necessary for the proper installation of his work and have the same provided during the erection of the

work in which such access panels occur and he shall be responsible for their proper and permanent location. Furnish rods at all lift-out panels. Tops shall be permanently fixed to the panels.

- C. Access panels shall be all steel construction, having frame of not less than No. 16 rust-proofed steel, rabbetted to receive cover and set flush with the finished wall or ceiling surfaces. In plaster walls and ceilings, they shall have plaster keys. In acoustically treated surfaces, they shall have suitable supporting anchors. Covers shall be rust-proofed stretcher leveled steel, of not less than No. 14 gauge and shall be secured with lockable clips and locking cams or countersink screws. The covers shall be flush with the frames and the finished wall or ceiling surfaces. Frames and covers shall be prime painted for finishing by others.

2.3 VOLUME DAMPERS

- A. Manual dampers shall be placed in branch ducts of all supply, return and exhaust systems for proper operation and adjustment of individual registers and diffusers and any part of the system. Supply grilles in walls and all exhaust grilles shall have the volume control incorporated in the grille. All volume control dampers shall be opposed blade type. No wood shall be used in construction of the dampers, all of which shall be the pan type.
- B. All dampers shall be made strong, rigid, fitted tightly and provided with angle iron stops, if necessary, the design, method of hanging, and control being suitable for location and service required. Where ducts are concealed above furred ceilings, flush type operators attached to the extended shaft of the dampers shall be provided.

2.4 BACKDRAFT DAMPERS

- A. Backdraft damper blades shall be aluminum construction (.051) with one half (1/2") diameter shaft with ball bearings and mounted into a 16 gauge galvanized steel frame. Each damper to have adjustable counter balanced feature for easy field adjustment. Backdraft dampers shall be Airstream Products Company Model CBD-6 or approved equivalent.
- B. Lightweight backdraft dampers with felted edge shall be placed in all gravity vent openings.

2.5 TURNING VANES

- A. Provide turning vanes constructed of one and a half (1 1/2") inches wide curved blades set at one-fourth (3/4") inches o.c. Supported with bars perpendicular to blades set at two (2") inches o.c., and set into side strips suitable for mounting in ductwork.
- B. Turning vanes shall be as manufactured by E.H. Price Company, Anemostat or approved equivalent.

2.6 FILTERS

- A. Unless otherwise specified, the filters will be furnished with the equipment and will be so specified in the equipment specifications.

- B. In all cases the equipment will be turned over to the owner with new filters in place after all construction dirt and debris has been cleaned up. If it becomes necessary for the HVAC air handling equipment to operate while construction is still in progress, this Contractor shall use (Merv 8) throw away filters to protect the coils, fans and ductwork.

2.7 MOTOR OPERATED DAMPERS

- A. Furnish and install motor operated dampers of the low-leakage type with a leakage rate of not greater than 6 cfm/sq. Ft. Based on a pressure differential of 4" w.g. Dampers and frames shall both be of extruded aluminum construction with airfoil type blades and plated steel damper shafts which rotate in nylon bushings. The drive shaft shall be extended to the outside of the section to permit connecting of damper motors. Operators shall be electric. Dampers shall be provided with flexible compression type stainless steel seals installed along the top, bottom, and sides of the frame. Seals along each blade edge shall be extruded vinyl in integral ribbed grooved inserts in blades. Dampers shall be the model cd50, as manufactured by ruskin, arrow, or approved equivalent. Interlock dampers and warm weather exhaust fans.

PART 3 - EXECUTION

3.1 DUCT ACCESSORIES

- A. All duct accessories shall be installed in accordance with the manufacturers' recommendations and with the SMACNA Standards and all applicable codes.

END OF SECTION 23 33 00

SECTION 23 34 23 – HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The scope of the work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for Owners' use.

PART 2 - PRODUCTS

2.1 ROOF MOUNTED EXHAUST VENTILATORS

- A. Furnish and install power roof ventilators and prefabricated curbs of types, sizes and capacities scheduled on the drawings. Ventilators higher in height than that shown or ventilators of a different type and configuration from that shown will not be acceptable.
- B. Factory-built roof curbs for power roof ventilators shall be furnished and installed by the Contractor. Curbs shall be constructed of aluminum with rigid fiberglass insulation and shall be of the self-flashing type. Minimum height to top of curb above finished roof shall be 12". Curb shall be constructed to conform with roof slope and arranged so that the roof ventilator is installed level. Curbs shall be the Greenheck Model GPF or approved equal. The Contractor shall be responsible for furnishing the general contractor with dimensions of roof openings and shall cooperate with the roofing subcontractor in properly flashing and counterflashing around all curbs for the new addition. Roof curbs shall be securely fastened to the roof deck in accordance with details furnished by the roof curb manufacturer. Top of curb shall be level. The Contractor shall anchor ventilators to curbs with stainless steel or cadmium plated screws or bolts 12" on centers on each side of curbs, 2" maximum from the curb corners or as recommended by the curb manufacturer. Strip flashing, roofing cement and finished roofing will be furnished and installed by the roofing subcontractor.
- C. Roof ventilators shall be fabricated from heavy gauge aluminum. Finish on ventilators shall be unpainted mill-finished aluminum. Hood shall have galvanized steel supports and shall be hinged for service access.
- D. Fan motors shall be wound for electrical characteristics scheduled on the drawings. Motors shall be suitable for continuous service. Motors shall be of the heavy duty type with permanently lubricated, sealed ball bearings. The wheel shaft shall be ground and polished steel and shall be mounted in heavy duty, permanently sealed pillow block ball bearings.

- E. Drives shall be sized for a minimum of 165% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing. The entire drive assembly shall be mounted on vibration isolators.
- F. Power roof ventilators shall be of the v-belt driven or direct driven, low silhouette,
- G. Centrifugal fan type with spun aluminum venturi and bird screen.
- H. Ventilators shall be completely weatherproof and securely sealed and fastened to the roof curb.
- I. Fan supporting framework shall be constructed of galvanized steel members. Fan wheels shall be nonoverloading, quiet-operating, statically and dynamically balanced, and shall be floated on vibration eliminators. Fan shafts shall be rustproofed.
- J. Power roof ventilators shall have amca certified air and sound ratings and shall be the Model G or GB as manufactured by Greenheck Fan Corp., Loren-Cook, ACME, or Penn Ventilator.
- K. Fans shall be furnished with integral mounted disconnect switch. Line side power connection shall be by the Electrical Contractor (BP22) and load side connection shall be by the Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION OF ROOF MOUNTED EXHAUST FANS

- A. Install the curb and secure to the roof deck.
- B. Install ductwork as shown and secure to the deck or base of the curb.
- C. Install backdraft dampers and check to make sure they are free to open and close.
- D. Install the fan and secure to the curb with stainless steel screws.
- E. Connect power and check rotation of fan.
- F. Systems are not complete until the systems have been balanced to provide the correct air quantity and has been tested to demonstrate the correct system performance. See section 23 05 93 – Testing, Adjusting, and Balancing of HVAC System.

END OF SECTION 23 34 23

SECTION 23 37 13 – DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The scope of the work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for Owners' use. **Egg crate grilles are prohibited.**

1.3 CODE COMPLIANCE

- A. All air terminal units shall be fabricated and installed in accordance with SMACNA Standards, NFPA 90A, NFPA 90B, ADC 1062, AMCA 50, and all other applicable codes.

PART 2 - PRODUCTS

2.1 EXHAUST, TRANSFER AIR GRILLES AND REGISTERS

- A. Furnish and install grilles and registers at exhaust or vent openings. The installation of grilles and registers shall be coordinated with work being done by the general contractor and contractors of other trades. Grilles and registers shall be located symmetrically at centers of ceiling tiles in acoustical tile ceilings. All grilles and registers shall be installed and located subject to coordination between all trades and the approval of the Architect.
- B. Ceiling mounted grilles and registers shall be suitable for installation in types of ceilings indicated on the Drawings.
- C. All grilles and registers shall be securely attached and supported from associated ductwork or, where not duct connected, shall be attached and supported from the building structural system. Grilles and registers shall not be supported on ceilings of any type.
- D. Grilles and register faces shall have factory painted finishes of color determined by the professional and shall be provided with foam neoprene or rubber border gaskets.
- E. Faces of registers shall be as described for the grilles above. The damper shall be opposed blade with key-operated mechanisms or setscrew locking device to hold the damper blades in any set position. The dampers shall be fabricated from steel with prime coat finish.

- F. Model 23RL as manufactured by Titus, Anemostat, E.H. Price, or Krueger.

2.2 CEILING DIFFUSERS

- A. Square or rectangular; one, two, three or four way discharge as shown on plans. Use directional cores. Furnish with gaskets, hinged interior baffles for altering discharge air pattern, etc.
- B. Provide quality construction of steel. Throw, pressure drop, sound level and overall performance shall meet job requirements; should diffusers not meet job requirements, remove and replace diffusers at no additional cost to Owner.
- C. Furnish each diffuser with deflectrol and key operated opposed blade volume control damper. Provide 6 sets of keys to Owner.
- D. Provide off-white baked enamel finish.
- E. Verify type of ceiling construction prior to submittal of shop drawings.
- F. Install diffusers after painting is completed.
- G. Model OMNI as manufactured by Titus, Anemostat, E.H. Price, or Krueger.

2.3 VAV DIFFUSERS

- A. Thermally powered to vary the supply air volume for both heating and cooling. Temperature settings for heating and cooling must be separately adjustable in the field.
- B. Factory install changeover thermal element and adjust to engage heating mode at 81°F and engage cooling mode at 70°F.
- C. Totally self-contained and self-actuating diffusers.
- D. Model therma-fuser (Model TF-HC) as manufactured by Acutherm "No Substitutions".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all grilles, and diffusers, flush with surface and level or straight with other similar items.
- B. Support the diffuser from the duct at the proper level to hold it snug against the ceiling.

END OF SECTION 23 37 13

SECTION 23 74 13 – PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLER UNITS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. Contractor shall accept delivery, store, protect, and set unit.

1.3 WARRANTY

- A. Unit shall have a (1) year parts and labor warranty, including performing any required unit maintenance on all items except heat exchangers and compressors.
- B. Compressors shall have a (5) year parts warranty.
- C. The gas heat exchanger shall have a standard 10-year warranty.
- D. All warranties shall commence at date of acceptance of installation by Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to strict compliance with the requirements of this Specification, provide rooftop unit manufactured as follows:
 - 1. Carrier **(basis of design on drawings)**
 - 2. Lennox
 - 3. York
 - 4. Trane

2.2 ROOFTOP UNIT

- A. Description: Factory assembled and tested; designed for roof installation; and consisting of compressors, condensers, evaporator coils, condenser, gas-fired heating section, and constant speed evaporator fans, acoustic curb, packaged inboard rooftop unit controls, remote programmable thermostat, filters, and dampers.
 - 1. Provide manufacturer's watertight installation kit for electrical/gas connections through the bottom of the unit.
- B. Rooftop unit capacity requirements shall be as scheduled on the Drawings:
 - 1. Unit performance
 - a. Unit cooling capacities shall be in accordance with and tested to ARI Standard 210/240 –89 or 360-85.
 - b. Unit shall carry the ARI compliance label.
 - c. Unit minimum cooling efficiency, including the standard supply air blower motor shall be as scheduled.
 - d. Unit shall have a minimum heating system efficiency of 80%.
 - e. Unit shall be safety certified in accordance with UL standard UL1995, and ANSI Standard Z21.47.
 - f. Unit shall be safety certified by an accredited testing laboratory.
 - g. Unit nameplate shall carry the label of the certification agency.
 - h. Unit shall be shipped completely assembled by the manufacturer including all standard items and optional items.
 - i. Unit shall be 100% run tested by the manufacturer with a copy of the run test report shipped with the unit.
- C. Construction
 - 1. Unit shall be completely factory assembled, piped and wired and shipped in one section.
 - 2. Unit shall be specifically designed for outdoor roof top application with a fully weatherproof cabinet.
 - 3. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20-gauge or heavier material.
 - 4. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
 - 5. Unit shall be furnished with 304 stainless steel or non-corrosive polycarbonate drain pans.
 - 6. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form.
 - 7. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.

8. Access to filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with quarter turn latches. Door fastening screws are not acceptable.
9. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit.
10. Air side service access doors shall have rain break overhangs.
11. All access doors shall have an internal metal liner to protect the door with fiberglass insulation.
12. The interior air side of the cabinet shall be entirely insulated on all exterior panels with fiberglass insulation.

D. Supply fans

1. Blower(s) shall be entirely self-contained on a slide deck for service and removal from the cabinet.
2. All blower(s) shall have backward inclined airfoil or forward curved blades.
3. Adjustable v-belt drive shall be provided with a minimum rating of 140% of the motor nameplate brake horsepower when the adjustable pulley is at the minimum rpm.
4. Blowers, drives and motors shall be dynamically balanced.

E. Outdoor air and economizer section

1. Shall be a modulating enthalpy controlled economizer with multi-stage integrated economizer and compressor operation for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure. A pressure relief damper sized for 100% relief air shall be provided as part of the economizer. Damper actuator shall also be wired to accept a CO2 override signal. A CO2 sensor shall be factory installed in the return air stream.

F. Condenser

1. Air cooled condenser section:
 - a. The condensing section shall be equipped with vertical discharge axial flow direct drive fans. Direct drive fans shall be directly connected to and supported by the motor shaft.
 - b. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes.
 - c. Condenser coils to be sized for a minimum of 10°F of refrigerant sub-cooling.

- G. Filters: FURNISH unit with Merv 8 filters (installed at factory). Furnish two (2) additional spare sets of Merv 8 filters. Filters shall be 2" deep and have a minimum Merv rating as described in ASHRAE Standard 52.2

H. Evaporator coils

1. Evaporator coils shall be copper tube with aluminum fins mechanically bonded to the tubes.
2. Evaporator coils shall have galvanized steel end casings.
3. Evaporator coils shall have equalizing type vertical tube headers.
4. Evaporator coils shall be furnished with a thermostatic expansion valve.
5. Evaporator coils shall be furnished with a double sloped drain pan for the positive drainage of condensate.
6. Evaporator coil drain pan(s) shall be fabricated of 304 stainless steel or noncorrosive polycarbonate.

I. Refrigeration system

1. Compressors shall have internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators. Each compressor shall have independent refrigerant circuits.
2. Compressors shall have a 5 year warranty.
3. Units over 6 ton capacity shall be multiple stage and shall have a minimum of 2 stages of capacity control.
4. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the door to the compartment is open.
5. Compressors shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
6. Systems shall be equipped with thermostatic expansion valve type refrigerant flow control.
7. Systems shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
8. Units shall be equipped with schrader type service fittings on both the high side and low pressure sides of the system.
9. Units shall be equipped with refrigerant liquid line driers.
10. Units shall be fully factory charged with R-410A refrigerant.
11. Units 12 tons capacity and greater shall be equipped with a 5 minute anti-short cycle delay timer for each stage.
12. Units 12 tons capacity and greater shall be equipped with 20 second between stage delay timers for each stage.

13. Units 12 tons capacity and greater, or as indicated on the drawings, shall be furnished with hot gas reheat and shall include a dehumidification cycle.

J. Gas heating section

1. Unit shall be provided with a gas heating furnace consisting of a heat exchanger with multiple concavities, an induced draft blower and an electric pressure switch to lockout the gas valve until the combustion chamber is purged and combustion air flow is established. Heat exchanger tubes with separate internal turbulators are not acceptable.
2. Unit shall be provided with a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but shall shut off the pilot when heating is not required. Unit shall have gas supply piping entrances in the unit base for through the curb gas piping and in the outside cabinet wall for across the roof gas piping.
3. Unit's tubular gas heat exchanger shall carry a standard 10 year warranty.
4. Unit shall heat using natural gas fuel.

K. Rooftop unit controls

1. Rooftop unit controls for 6 ton capacity and below, shall be unit mounted microprocessor based and shall provide continuous control of all aspects of the HVAC system including integration with remote programmable thermostat, with manual override, high and low "Unoccupied" temperature setpoints. Also refer to Section 23 09 00.
2. Rooftop unit controls for 12 ton capacity and greater equipped with humidity control, shall be unit mounted microprocessor based and shall provide continuous control of all aspects of the HVAC system including integration with remote programmable thermidstat, with manual override, high and low "Unoccupied" temperature setpoints. Also refer to Section 23 09 00.
3. Thermostat/Thermidstat shall have temperature setpoint adjustment.
4. A smoke detector shall be factory installed and wired to the remote audio/visual alarm. Rooftop unit manufacturer shall coordinate installation of devices and wiring requirements (to A/V alarm) with contractor. (Refer to Specification Section 23 09 00)
5. "control of rooftop unit" shall be as follows:
 - a. General: the unit is constant volume, having a supply air fan, gas heating section, cooling with a full modulating economizer section. All controls shall be provided by rooftop unit mfr and shall include all controls for rooftop unit. The remote programmable thermostat/thermidstat shall be programmed according to building warm-up/occupied/unoccupied schedules. All setpoints listed shall be used for start-up and may be adjusted to suit operating conditions of the building.
 - b. Safeties: Whenever the supply fan feedback input indicates the supply fan is off; the outdoor damper shall close and the return air damper shall open.
 - c. Warm Up: The unit shall be indexed to the warm-up cycle of operation based on the outdoor air temperature and the indoor space temperature. When the outdoor air temperature is below 55F and the space temperature is below the occupied

setpoint, the unit shall be indexed to operate in a warm-up cycle. When the unit is indexed to the warm-up cycle of operation, the supply fan shall be energized. The outdoor air damper shall be closed with the return damper open full. If the unit is in a warm-up cycle, the supply fan shall operate continuously (with heat provided by unit gas heating section) until the space temperature rises to the 70F warm-up setpoint. The warm up cycle shall be set for a 60 minute (adjustable) run time.

- d. Occupied: The factory provided controller mounted in the rooftop unit shall be in constant communications with the thermostat/thermidstat to control the supply air temperature from the unit to allow optimized operation to satisfy the bank.
 - e. Free Cooling: When the outdoor air is suitable for cooling (outside air enthalpy setpoint not exceeded) the unit controller shall allow the mixing box dampers to modulate to provide cooling. On a rising supply air temperature, the outdoor air damper shall gradually modulate open with the return damper closing proportionately to satisfy the supply air setpoint. When the unit is in the economizer mode, the mixed air temperature sensor shall be used by the unit controller to prevent overshoot and modulate the mixing box dampers to maintain a minimum mixed air temperature of 50f. The use of free cooling shall be initiated by the unit controller determining if cooling is desired and if the outside air heat/cool content is suitable to aid in cooling.
 - f. Carbon Dioxide: Return air carbon dioxide sensor shall control the unit outdoor and return air dampers to only allow the unit outdoor air damper to open past the 10% position whenever the return air carbon dioxide setpoint (900 ppm) is exceeded. The carbon dioxide sensor shall input an analog signal to the rooftop unit controller to allow modulation output to the outdoor air damper actuator. The only other control sequence that shall allow additional outdoor air admission to the building is the free cooling sequence.
 - g. Unoccupied: The unit supply fan will be de-energized. The outdoor air damper shall close with the return damper opening full. The unit controller shall monitor space temperature. If the space falls below 55F, the supply fan shall be energized and the supply fan and gas heat shall operate. As the space temperature rises to 58F, the fan and gas heat shall be de-energized.
 - h. If the space temperature rises above 82°, the supply fan shall be energized and the supply fan and refrigeration section shall operate. As the space temperature drops to 79°, the fan and refrigeration section shall be de-energized.
6. Rooftop units shall be provided with at factory by unit mfr:
- a. Control System
 - 1) Unit controller
 - 2) Full modulating economizer (with O.A. enthalpy)
 - 3) Space temperature sensor (unoccupied cycle)
 - 4) Return air carbon dioxide sensor (0-10vdc)
 - 5) Occupied/unoccupied scheduling (internal clock)
 - 6) All factory programming
7. Rooftop unit rtu
- a. ATC diagram for wiring from room stat to rooftop unit

L. Power

- 1. Units shall be provided with a factory installed and wired internal disconnect.

2. Units shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.
3. Units shall be provided with a factory installed and wired 115 volt, 15 amp ground fault service receptacle powered by a 1.5 kva transformer.

M. Barometric relief

1. Units shall be capable of barometric relief. Motor operated dampers shall be parallel blade type.

2.3 ACOUSTIC ROOF CURB

- A. Roof curb shall be maximum 18" high acoustically lined type, constructed of galvanized steel with inlet and outlet offset to further promote attenuation. Curb shall be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support cross structure support and air seal for the unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment shall be installed in strict accordance with the manufacturer's recommendations.
- B. Factory certified technicians shall perform "Start Up" and testing of rooftop units and respective HVAC system (witnessed by the Owner's representative). Submit final start-up and testing reports.
- C. Refer to section 23 09 00 "Instrumentation and Control for HVAC System" for additional requirements.
- D. After initial start-up, testing of rooftop units and HVAC system shall be performed (by factory certified technician) for seasonal testing when outdoor temperatures are averaging 30°F and 80°F.

END OF SECTION 23 74 13

SECTION 23 82 19 - FAN COIL UNITS

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 fan-coil units and accessories.

1.3 DEFINITIONS

- A. BAS: Building automation system.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension components.
 - 2. Structural members to which fan-coil units will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 6. Perimeter moldings for exposed or partially exposed cabinets.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of fan-coil unit indicated.
- F. Field quality-control test reports.

- G. Operation and Maintenance Data: For fan-coil units 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. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.
- H. Warranty: Special warranty specified in this Section.

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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.6 COORDINATION

- A. Coordinate layout and installation of fan-coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate size and location of wall sleeves for outdoor-air intake.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Compressor failure.
 - b. Condenser coil leak.
 - 2. Warranty Period: Five years from date of Substantial Completion.
 - 3. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
 - 4. Warranty Period (Condenser Coil Only): Five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan-Coil-Unit Filters: Furnish one spare filters for each filter installed.
 - 2. Fan Belts: Furnish one spare fan belts for each unit installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. In the Fan-Coil-Unit Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 3. Basis-of-Design Product: The design for each fan-coil unit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 DUCTED FAN-COIL UNITS

- A. Basis-of-Design Product: Trane or a comparable product by one of the following:
- B. Manufacturers:
 - 1. Carrier Corporation; Carrier Air Conditioning Div.
 - 2. Lennox Industries Inc.
 - 3. McQuay.
 - 4. Trane Co. (The); Worldwide Applied Systems Group.
 - 5. Goodman Global Group, Inc
- C. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.
- D. Coil Section Insulation: 1/2-inch thick coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
 - 1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 - 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- E. Drain Pans: Insulated galvanized steel with plastic liner. Fabricate pans and drain connections to comply with ASHRAE 62.1-2004.
- F. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.
- G. Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.
 - 1. Supply-Air Plenum: Sheet metal plenum finished and insulated to match the chassis.
 - 2. Return-Air Plenum: Sheet metal plenum finished to match the chassis.

3. Mixing Plenum: Sheet metal plenum finished and insulated to match the chassis with outdoor- and return-air, formed-steel dampers.
 4. Dampers: Galvanized steel with extruded-vinyl blade seals, flexible-metal jamb seals, and interlocking linkage.
- H. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Washable Foam: 70 percent arrestance and 3 MERV.
 2. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
 3. Pleated Cotton-Polyester Media: 90 percent arrestance and 7 MERV.
- I. Indoor Refrigerant Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and brazed joints at fittings. Comply with ARI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve.
- J. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
- K. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.
- L. Belt-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the cabinet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.
1. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- M. Remote condensing units are specified in Division 23 Section "Packaged Compressor and Condenser Units."
- N. Remote Condensing Units: Factory assembled and tested, consisting of compressors, condenser coils, fans, motors, refrigerant receiver, and operating controls. Construct, test, and rate condensing units according to ARI 210/240 and ASHRAE 15.
1. Casing: Steel with baked-enamel finish, removable panels for access to controls, weep holes for water drainage, and mounting holes in base.
 2. Compressor: Hermetic, reciprocating type; internally isolated for vibration with factory-installed safety devices as follows:
 - a. Antirecycle timer.
 - b. High-pressure cutout.
 - c. Low-pressure cutout or loss-of-charge switch.
 - d. Internal thermal-overload protection.
 - e. Current and voltage sensitive safety devices.
 3. Compressor Motor: Start capacitor, relay, and contactor. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 4. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

5. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
 6. Refrigerant: R-410A.
 7. Low ambient controls to permit operation down to 45 deg F.
 8. Crankcase heater.
 9. Charging and service fittings on exterior of casing.
 10. Filter dryer.
 11. Hot-gas-bypass, constant-pressure expansion valve and controls to maintain continuous refrigeration system operation at 10 percent of full load.
 12. Condenser: Copper-tube, aluminum-fin coil, with liquid subcooler.
 13. Condenser Fan: Direct-drive, aluminum propeller fan.
 - a. Motor: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 14. Accessories: Polyethylene mounting base to provide a permanent foundation.
- O. Control devices and operational sequence are specified in Division 23 Section "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."
- P. Basic Unit Controls:
1. Control voltage transformer.
 2. Wall-mounting thermostat with the following features.
 - a. Cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Exposed set point.
 - g. Exposed indication.
 - h. Degree F indication.
 3. Wall-mounting temperature sensor.
 4. Unoccupied-period-override push button.
 5. Data entry and access port.
 - a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
 - b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.
- Q. Electrical Connection: Factory wire motors and controls for a single electrical connection.
- R. Capacities and Characteristics:
1. Fan:
 - a. Airflow
 - b. Static Pressure
 - c. Fan Speed
 - d. Motor Speed
 - e. Motor Horsepower
 - f. Drive: Direct Belt.

2. Cooling Capacity:
 - a. Total
 - b. Sensible
 - c. Entering-Air Dry-Bulb Temperature
 - d. Entering-Air Wet-Bulb Temperature
3. Refrigerant Coil:
 - a. Air-Side Pressure Loss
 - b. Suction Temperature
4. Condensing Unit:
 - a. Compressor Power Input
 - b. Energy-Efficiency Ratio
 - c. Cooling Energy Efficiency (EER) (SEER)
 - d. Heating Coefficient of Performance
 - e. Voltage/Phase/Hertz
 - f. Full-Load Amperes
 - g. Maximum Circuit Amperes
 - h. Maximum Overcurrent Protection
5. Filters:
 - a. Face Area
 - b. Thickness: 1 inch (25 mm).
6. Electrical Characteristics for Single-Point Connection:
 - a. Voltage/Phase/Hertz
 - b. Full-Load Amperes
 - c. Maximum Circuit Amperes
 - d. Maximum Overcurrent Protection

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before fan-coil-unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fan-coil units level and plumb.
- B. Install fan-coil units to comply with NFPA 90A.

- C. Suspend fan-coil units from structure with elastomeric hangers. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.
- E. Install new filters in each fan-coil unit within two weeks after Substantial Completion.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
 - 1. Install piping adjacent to machine to allow service and maintenance.
 - 2. Connect piping to fan-coil-unit factory hydronic piping package. Install piping package if shipped loose.
 - 3. Connect condensate drain to indirect waste.
 - a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.
- B. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.

- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 82 19

SECTION 26 02 10 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 ELECTRICAL WORK

- A. These Specifications are issued to cover all work in connection with the complete installation of the electrical work. Electrical work is hereby defined to include work as herein specified and as shown on the Drawings issued in connection with this project. Any reference in the Division 26 Specifications Sections to the Contractor shall hereby be considered a reference to the Electrical Contractor (BP22). Any reference to letting of work to subcontractors or manufacturers in these Specifications does not relieve the Contractor of his responsibility of the Work, materials, and equipment under this Contract. The contractor is responsible for the Work and performance of his subcontractors.

1.2 EXECUTION OF THE WORK

- A. These Specifications call out certain duties of the Electrical Contractor (BP22) and/or subcontractors. They are not intended as a material list of items required by the Contract.
- B. This Division of the Specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades.
- C. Provide all items and work indicated on the Drawings and all items and work called for in this Division of the Specifications in accordance with the conditions of Contract (Division 01 General Requirements Documents). This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.
- D. Comply with all provisions of the Contract Documents including (Division 01), (General Conditions, and Supplementary General Conditions) of the Specifications.
- E. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these Specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
- F. Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the Work. At time of bid the most stringent requirements must be included in said bid. Install and coordinate the electrical work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. All changes required in the Work of the Contractor caused by neglect shall be corrected at the expense of the Contractor.

- G. It is the intent of the Drawings and Specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform with the intent, are to be considered a part of the Contract.
- H. These Specifications are basically equipment and performance Specifications. Actual installations shall be as shown on the Drawings. Installations and details shown on the Drawings shall govern where these differ from the Specifications.
- I. All materials furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the underwriters laboratory, inc. Label provided a standard has been established for the material in question.
- J. All products and materials to be new, clean, free of defects and free of damage and corrosion.
- K. No exclusion from, or limitation in, the symbolism used on the Drawings for electrical work or the languages used in the Specifications for electrical work shall be interpreted as a reason for omitting accessories necessary to complete any required system or item of equipment.
- L. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
- M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted.

1.3 COORDINATION OF THE WORK

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate, project and schedule work with other trades in accordance with the construction sequence.

- F. The locations of lighting fixtures, outlets, panels and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the Work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the Work, or for other legitimate causes.
- G. Exercise particular caution with reference to the location of panels, outlets, switches, etc., and have precise and definite locations approved by the Engineer before proceeding with the installation.
- H. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and shall receive approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- I. Obtain from the Engineer in the field the location of such outlets or equipment not definitely located on the Drawings.
- J. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuit numbers on the finished record tracing and on panel directory card. Where circuiting is not indicated, the Electrical Contractor must provide required circuiting in accordance with the loading indicated on the Drawings and/or as directed.
- K. The Drawings generally do not indicate the exact number wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC.
- L. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. To accommodate the Work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to installation.
 - 1. Right of way: lines which pitch to have the right- of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
 - 2. Make offsets, transitions and changes in direction in raceways and as required to maintain proper head room in pitch of sloping lines whether or not indicated on the Drawings.
- M. Wherever the Work is of sufficient complexity, prepare additional detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the Work with the Work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the Work and its relation to the Work of other trades before commencing shop fabrication or erection in the field.

- N. Contractor shall furnish services of an experienced superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the Work of other trades. No work shall be installed before coordinating with other trades.

1.4 EXAMINATION OF SITE

- A. Prior to submitting of bids, the Contractor shall visit the site of the job and shall familiarize himself with all conditions affecting the proposed installation and shall make provisions as to the cost thereof. Failure to comply with the intent of this paragraph will in no way relieve the Contractor of performing all necessary work shown on the Drawings.

1.5 PROGRESS OF WORK

- A. The contractor shall order the progress of his work so as to conform to the progress of the Work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Engineer.
- B. Delivery of materials: deliver materials (except bulk materials) in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Storage of materials, equipment and fixtures: store materials suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage in dry, heated spaces.

1.7 EQUIPMENT ACCESSORIES

- A. Establish sizes and location of the various concrete bases required. Coordinate with general contractor and provide all necessary anchor bolts together with templates for holding these bolts in position.
- B. Provide supports, hangers and auxiliary structural members required for support of the Work.
- C. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls and floors and elsewhere as will be required for the proper protection of each raceway and passing through building surfaces.
- D. Wall mounted equipment, total weight of 100 pounds or less, may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall.

Groups or arrays of equipment, with total weight of more than 100 pounds, shall be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by kindorf, globe-strutt and unistrut, may be used for mounting arrays of equipment.

1.8 EXCAVATION AND TRENCHING

- A. Provide excavation for the Work. Excavate all material encountered, to the depths indicated on the Drawings or required. Remove from the site excavated materials not required or suitable for backfill. Provide grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Remove any water accumulating therein. Provide sheeting and shoring as may be necessary for the protection of the Work and for the safety of personnel.
- B. Provide trenches of widths necessary for the proper execution of the Work. Grade bottom of the trenches accurately to provide uniform bearing and support the Work on undisturbed soil at every point along its entire length. Except where rock is encountered, do not excavate below the depths indicated. Where rock excavations are required, excavate rock to a minimum overdepth of four inches below the trench depths indicated on the Drawings or required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly machine tamped to a compaction level as specified by the Engineer. Whenever unstable soil incapable of properly supporting the Work is encountered in the bottom of the trench as determined by the Engineer, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel or other suitable material.
- C. Excavate trenches for utilities to a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grade, whichever is lower, unless otherwise specifically shown.
 - 1. PRimary electric service: 4 feet (minimum).
 - 2. Secondary electric service: 2 feet (minimum).
 - 3. Telephone service: 2 feet (minimum).

1.9 BACKFILLING OF TRENCHES

- A. Do not backfill trenches until all required tests have been performed and the installation observed by the Engineer. Comply with the requirements of other sections of these Specifications. Deposit backfill in 6 inch layers and thoroughly and carefully tamp until the Work has a cover of not less than 1 foot. Backfill and tamp remainder of trench at 12 inch intervals until complete. Uniformly grade the finished surface. Install a 6" marking ribbon 12" above conduits.

1.10 CUTTING, PATCHING, ETC.

- A. The Work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation,

support or anchorage of raceway, outlets or other equipment, the Work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. Shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.

- B. The contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless he first obtains permission from the Engineer. If permission is granted, the Contractor shall perform this work in a manner approved by the Engineer.
- C. Where conduits, outlet, junction, or pull boxes are mounted on a painted surface, or a surface to be painted, they shall be painted to match the surface. Whenever support channels are cut, the bare metal shall be cold galvanized.
- D. Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. The trade requiring them to properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.

1.11 NOMINAL VOLTAGES (UNLESS OTHERWISE NOTED)

- A. Primary Distribution: Per local utility.
- B. Secondary Distribution: 277/480 volt, 3-phase, 4-wire.

1.12 MOUNTING HEIGHTS

- A. Unless otherwise noted or required because of special conditions, locate outlets as follows:
 - 1. Heights listed are from finished floor to center of device. Verify exact locations with the Engineer before installation.
 - a. Wall switch outlets 40"
 - b. Bracket outlets 7'- 0" to bottom
 - c. Convenience outlets (general) 18"
 - d. Convenience outlets (mechanical areas) 4' - 0"
 - e. Panelboard and distribution cabinet to top 6' - 6"
 - f. Desk telephone outlets 18"
 - g. Wall telephone outlets 4' - 0"
 - h. Television outlets 6' - 0"
 - i. Television outlets (phlebotomy ward) to structure above ceiling

1.13 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Architect's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.

- C. All switchboards, panelboards, wireways, trench ducts, cabinets, enclosures, etc. Shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect as required.

1.14 WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect and obtain written permission before penetrating and waterproof membrane, even where such penetration is shown on the Drawings. Perform work so as to maintain any warranties currently in effect.
- B. If this Contractor penetrates any walls or surfaces after they have been waterproofed, this Contractor shall restore the waterproof integrity of that surface at the expense of this Contractor and as directed by the Architect.

1.15 SUPPORTS

- A. Support work in accordance with the best industry practice and the following.
- B. Include supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets.
- C. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free-standing position.
- D. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
- E. Nothing, (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways, or cables for support, except that threaded hub type fittings having a gross volume not in excess of 100 cubic inches may be supported from heavy wall conduit, where the conduit in turn is securely supported from the structure within five inches of the fitting on two opposite sides.
- F. Nothing shall rest on, or depend for support on, suspended ceilings media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling).
- G. Provide required supports and hangers for conduit, equipment, etc., so that loading will not exceed allowable loadings of structure.

1.16 FASTENINGS

- A. Fasten electric work to building structure in accordance with the best industry practice and the following.

- B. As a minimum procedure, where weight applied to the attachment points is 100 pounds or less, fasten to building elements of:
1. Wood -- with wood screws.
 2. Concrete and solid masonry -- with bolts and expansion shields.
 3. Hollow construction -- with toggle bolts.
 4. Solid metal -- with machine screws in tapped holes or with welded studs.
 5. **Steel decking or subfloor – not allowed.**
- C. As a minimum procedure, where weight applied to building attachment points exceeds 100 pounds, but is 300 pounds or less, conform to the following:
1. At concrete slabs utilize 24" x 24" x 1/2" steel fishplates on top with through bolts. Fishplate assemblies shall be chased in and grouted flush with the top of slab screen line, where no fill is to be applied.
 2. **At steel decking or subfloor is not allowed.**
 3. Where weight applied to building attachments points exceeds 300 pounds, coordinate with and obtain approval of Architect and conform to the following:
 - a. Utilize suitable auxiliary channel or angle iron bridging between building structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Utilize threaded rods or bolts to attach to bridging members.
 4. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
 5. For items which are shown as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to the building structural elements.

1.17 PRODUCTS

- A. If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.

1.18 OMISSIONS FROM THE DRAWINGS

- A. Should a bidder find discrepancies in or omissions from the Drawings or Specifications or be in doubt as to their meaning, he shall notify the Engineer before submitting his proposal. The engineer will in turn, send written instructions to all bidders. Neither the Engineer nor the Owner will be responsible for oral instructions. If the Contractor fails to comply with this

requirement, he shall accept the Engineer's interpretations as to the intended meaning of the Drawings and Specifications.

1.19 EXECUTION

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Architect before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation. Clean up all debris.
- D. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.
- E. Applicable equipment and materials to be listed by underwriters' laboratories and manufactured in accordance with asme, nema, ansi or ieee standards and as approved by local authorities having jurisdiction.
- F. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

1.20 DISPOSAL

- A. All electrical items not designated by Owner for his use to be properly disposed of according to local, state and federal regulations.
- B. Items containing polychlorinated biphenyl (PCB) to be removed, transported and disposed of according to federal toxic substances control act (TSCA). Contractor to submit certification that these items have been properly disposed of.

1.21 VERIFICATION OF ELECTRICAL REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS

- A. Prior to the installation of wiring systems for any equipment furnished by others, this Contractor shall verify that the electrical requirements of the equipment match those shown on the electrical Drawings by examining the approved Shop Drawings of that equipment. Any discrepancies shall be immediately reported to the Engineer.
- B. If the Contractor fails to comply with this requirement, he shall be responsible for any additional costs incurred at no additional cost to the Owner.

END OF SECTION 26 02 10

SECTION 26 02 10.10 -ABBREVIATIONS AND DEFINITIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Utilize the following abbreviations and definitions for discernment within the drawings and specifications.

1. Abbreviations:

- a. NEC National Electrical Code
- b. OSHA Occupational Safety and Health Act
- c. ANSI American National Standards Institute
- d. NFPA National Fire Protection Association
- e. ASA American Standards Association
- f. IEEE Institute of Electrical and Electronics Engineers
- g. NEMA National Electrical Manufacturers Association
- h. UL Underwriters' Laboratories, Inc.
- i. IES Illuminating Engineering Society
- j. ICEA Insulated Cable Engineers Association
- k. ASTM American Society of Testing Materials
- l. ETL Electrical Testing Laboratories, Inc.
- m. CBM Certified Ballast Manufacturers
- n. EIA Electronic Industries Association
- o. OEM Original Equipment Manufacturer
- p. ADA Americans with Disabilities Act

2. Definitions:

- a. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test and turn over to Owner, complete and ready for regular operation, the particular work referred to.
- b. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular work referred to.
- c. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application for the particular work referred to.
- d. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such work.
- e. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- f. "AS DIRECTED" means as directed by the Architect or his representative.
- g. "CONCEALED" means installed behind wall furring or within double partitions or installed within hung ceilings.
- h. "EMBEDDED" means contained within floor slabs, masonry or other construction.

END OF SECTION 26 02 10.10

SECTION 26 02 10.15-WORK INCLUDED

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide the work included in accordance with the Contract Documents.
- B. Provide all labor, materials, equipment, tools, appliances, auxiliaries, services, hoisting, scaffolding, support, supervision, and Project Record Documents, and perform all operations for the Documents, and perform all operations for the furnishing and installing of the complete electrical furnishing and installing of the complete electrical system, including but not limited to the work described hereinafter. The work shall meet or exceed the latest codes, regulations and requirements of the local community and/or any governing body having jurisdiction.
- C. The electrical work is shown schematically on the Drawings to indicate the general system arrangement and configuration. The work of this Division shall include coordination with the work of other Divisions of the Specifications and the Contract Documents so as to provide a complete and operational system capable of being readily operated and maintained, including approved re-arrangement of the systems and equipment and re-routing of distribution services to enable the complete system to fit within the confines of the allotted electrical spaces, all to the satisfaction of the Architect.

END OF SECTION 26 02 10.15

SECTION 26 02 10.16-CODES, FEES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Comply with Codes in accordance with the Contract Documents.

1.2 CODES

- A. The electrical installation shall be in compliance with the requirements of OSHA, NEC and the rules, regulations and requirements of the power company supplying power to the building.
- B. The electrical installation shall comply fully with all county and state laws, ordinances and regulations applicable to electrical installations.
- C. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE and UL.
- D. Should any change in Drawings or Specifications be required to comply governmental regulations, the contractor shall notify Architect prior to execution of the work. The work shall be carried out according to the requirements of such code in accordance with the instruction of the Architect and at no additional cost to the Owner.

1.3 FEES

- A. All local fees and permits and services of inspection authorities shall be obtained and paid for by the Contractor. The Contractor shall cooperate fully with local utility companies with respect to their services. Contractor shall include in his bid, any costs to be incurred relative to power service (primary and/or secondary) and telephone service.

1.4 CERTIFICATE OF INSPECTION

- A. Certificate of Inspection and approval shall be procured and paid for by this Contractor from the Inspection Agency having jurisdiction in this area and delivered to the Architect before final payment is made.

End of section 26 02 10.16

SECTION 26 02 10.17 - REVIEWS AND ACCEPTANCES

PART 1 - GENERAL

1.1 SUBSTITUTION OF MATERIALS OR EQUIPMENT

- A. Reference shall be made to Division 01, "Submittal Procedures" section, for substitution of material or equipment in this Division of the Specifications.
- B. Materials specified by name or catalog number are base bid items and substitutions are not permitted. If the Contractor elects to submit a substitution, it shall be listed on his base bid as an addition or deletion to his base bid.

1.2 SHOP DRAWINGS

- A. Prepare and submit detailed shop drawings for materials, systems and equipment as listed herein, including locations and sizes of all openings in floor decks, walls and floors.
- B. The work described in any shop drawing submission shall be carefully checked for all clearances (including those required for maintenance and servicing), field conditions, maintenance of architectural conditions and proper condition with all trades on the job. Each submitted shop drawing shall include a certification that all related job conditions have been checked and that no conflict exists.
- C. All drawings shall be submitted sufficiently in advance of final requirements to allow ample time for checking and resubmittal as may be required. All submittals shall be complete and contain all required and detailed information. Copies of catalog pages are not acceptable. All submittals shall be legible.
- D. Acceptance of any submitted data or shop drawings for material, equipment apparatus, devices, arrangement and layout shall not relieve Contractor from responsibility of furnishing same of proper dimensions and weight, capacities, sizes, quantity, quality and installation details to efficiently perform the requirements and intent of the Contract. Such acceptance shall not relieve Contractor from responsibility for errors, omissions or inadequacies of any sort on submitted data or shop drawings.
- E. Shop drawings shall be submitted by specification section. Each section requiring submission shall be complete, partial section submissions will not be accepted. Each submission shall contain a coversheet with the required information completely filled out. The coversheet shall contain the project title and reference to applicable drawing and specification articles. Blank forms will be provided upon request.

1.3 SHOP DRAWING SUBMITTALS

A. Submit for the architect's approval shop drawings of the following and any other shop drawings requested:

1. Meter center
2. Panelboards
3. Disconnect switches
4. Fuses
5. Circuit breakers
6. Light fixtures
7. Wiring devices

END OF SECTION 26 02 10.17

SECTION 26 02 10.18 - GUARANTEE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide a guarantee in accordance with the Contract Documents.
- B. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one (1) year from date of final acceptance by the Owner, except that where guarantees or warranties for longer terms are specified herein, such longer term to apply. Within 24 hours after notification, correct any deficiencies which occur during the guarantee period at no additional cost to Owner, all to the satisfaction of the Owner and Architect. Obtain similar guarantees from subcontractors, manufacturers, suppliers and subtrade specialists.

END OF SECTION 26 02 10.18

SECTION 26 05 19 - WIRE AND CABLE (600 VOLTS AND BELOW)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide 600 volt wire and cable in accordance with the Contract Documents.

1.2 STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Conductors:
 - A. ASTM
 - B. ICEA
 - 2. Terminal blocks:
 - a. UL-1059

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

- A. General
 - 1. Provide wire with a minimum insulating rating of 600 volts, except for wire used in 50 volts or below applications for control of signal systems use 300 volt minimum or 600 volt where permitted to be incorporated with other wiring systems.
- B. Conductor
 - 1. Electrical grade, annealed copper, tinned if rubber insulated, and fabricated in accordance with ASTM standards. Minimum size number 12 for branch circuits; number 14 for control wiring.
 - 2. The conductors shown on the drawings are copper, except as noted otherwise.
- C. Stranding and number of conductors
 - 1. Number 12 and number 10 solid.

2. Cables larger than number 10, stranded in accordance with ASTM Class B stranding designations.
3. Control wires stranded in accordance with ASTM Class B stranding designations.
4. Cables, multi-conductor unless otherwise noted for low tension systems.

D. Insulation

1. Type THWN/THHN insulation suitable for use in wet locations up to 75 degrees Centigrade. Use for lighting, receptacle and motor circuits and for panel and equipment feeders.
2. Type THHN - Flame Retardant: Heat-resistant thermoplastic insulation, nylon jacket rated for 90 degrees Centigrade operation. Use for lighting branch circuit wiring installed and passing through the ballast channels of fluorescent fixtures, wiring in metal roofdecks in or near roof insulation, in attic or joist spaces, or in raceways exposed to the sun.
3. Type XF - Crosslinked polyolefin insulated heat-resistant wire suitable for 150 degrees Centigrade operation. Use for fixture wiring or any wiring within 3 feet horizontally or 10 feet above any furnace, boiler or similar appliance.

E. Color Coding

1. Provide consistent color coding of all feeders, sub feeders, motor circuits and the likes as follows:

120/208 VOLTS CODE

Phase A - Black
Phase B – Red
Phase C – Blue
Neutral – White
Ground - Green

2. Color-code wiring for control systems installed in conjunction with mechanical and/or miscellaneous equipment in accordance with the wiring diagrams furnished with the equipment. Factory color code wire number 2 and smaller. Wire number 1 and larger may be color coded by color tapping of the entire length of the exposed ends.

2.2 CONNECTORS

- A. Make connections, splices, taps and joints with solderless devices, mechanically and electrically secure. Protect exposed wires and connecting devices with electrical tape or insulation to provide not less than that of the conductor.

- B. Branch Circuit wires (Number 10 and smaller): Use any of the following types of terminals and connecting devices:
 - 1. Hand Applied
 - a. Coiled tapered, spring wound devices with a conducting corrosion-resistant coating over the spring steel and a plastic cover and skirt providing full insulation for splice and wired ends. Screw connector on by hand.
 - 2. Tool Applied
 - a. Steel cap, with conduction and corrosion resistant metallic plating, open at both ends, fitted around the twisted ends of the wire and compressed or crimped by means of a special die designed for the purpose. Specifically fitted plastic or rubber insulating cover wrap over each connector.

2.3 ELECTRICAL TAPE

- A. Specifically designed for use as insulating tape.

2.4 LUBRICANT

- A. Use lubricant only where the possibility of damage to conductors exists. Use only a lubricant approved by the cable manufacturer and one which is inert to cable and raceways.

PART 3 - EXECUTION

3.1 WIRE AND CABLE

- A. Provide a complete system of conductors in raceway system. Mount wiring through a specified raceway, regardless of voltage application.
- B. Drawings do not indicate size of branch circuit wiring. For branch circuits whose length from panel to furthest outlet exceeds 100 feet for 120-volt circuits, use number 10 or larger.
- C. Do not install wire in incomplete conduit runs nor until after the concrete work and plastering is completed and moisture is swabbed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily accessible pull, junction, or outlet.
- D. Provide cable supports for all vertical risers where required by code.
- E. Flashover or insulation value of joints to be equal to that of the conductor. Provide underwriters' laboratories listed connectors rated at 600 volts for general use and 1,000 volts for use between ballasts and lamps or gaseous discharge fixtures.
- F. Use terminating fittings, connectors, etc., of a type suitable for the specified cable furnished. Make bends in cable at termination prior to installing compression device. Make fittings tight.

- G. Extend wire sizing for the entire length of a circuit, feeder, etc. Unless specifically noted otherwise.

3.2 NEUTRAL WIRE

- A. A separate neutral wire shall be installed for each circuit. A common neutral for two or three circuits is not permitted.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide a low impedance grounding system in accordance with the Contract Documents.

1.2 STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Underwriters Laboratory Standard No. UL 467
 - 2. ANSI C-1 1978.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish and install an electrical grounding system as indicated on the Construction Documents and as specified herein.
- B. Grounding systems shall be installed in accordance with the requirements of the local authorities, NEC Section 250, and subject to the approval of the Engineer.
- C. All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.

2.2 GROUNDING SYSTEMS

- A. The system neutral shall be grounded at the service entrance only, and kept isolated from grounding systems throughout the building.
- B. Each system of continuous metallic piping and ductwork shall be grounded in accordance with the requirements of the NEC Section 250.
- C. Bond each section of switchboard housing and service conduits entering switchboards to ground bus.

- D. Metal conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated couplings, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.
- E. All conduits, metal raceways, boxes, cabinets, etc. Installed by this contractor and all motors and equipment connected shall be properly bonded and grounded.
- F. In all feeders and branch circuits install a green colored ground wire to each panel, cabinet, receptacle, motor or a piece of control equipment.
- G. The green ground wires shall be extended and connected to the ground bus in the panels or equipment enclosure. Neutral wiring system shall not be used for this purpose. Green ground wire shall be connected to all junction or pull boxes through which they pass and to all cabinet and panel enclosures.
- H. This ground wire shall be run in same conduit as phase and neutral wires feeding equipment, motor or receptacles and conduit size shall be increased if necessary. This conductor shall be installed whether or not shown on the drawings and shall be sized in accordance with NEC but shall not be smaller than #12 AWG. Motors shall be grounded by a grounding terminal in their connection box. Tie all ground wires together in panels and connect to ground bus in panel cabinet.
- I. All electrical equipment including lighting fixtures shall be grounded in the same manner as motors. All equipment shall be solidly grounded to the green covered wire and this contractor shall furnish grounding lugs as required.

2.3 GROUNDING METHODS

- A. Ground rods where shown shall be copper-clad steel not less than 3/4 inch in diameter, ten (10) feet long, driven full length into the earth. The maximum resistance shall not exceed 25 ohms.
- B. Install a bare ground wire around the perimeter of the building and connect to columns where noted.
- C. A metal underground water piping system used for grounding shall be in direct contact with the earth for ten feet or more and shall be electrically continuous. Provide bonding jumpers at water meter and at insulating joints.

PART 3 - EXECUTION

3.1 GENERAL

- A. Grounding connections and splices shall be brazed molded exothermic welded, bolted clamp terminal or pressure- connector type. Bolted connections and pressure- connectors shall be used for connections to removable equipment. Brazed connections shall be made where noted on drawings.

END OF SECTION 26 05 26

SECTION 26 05 33 -RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide raceways in accordance with the Contract Documents.

1.2 STANDARDS

- A. Except as modified by governing codes and by the contract documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Rigid Conduit - RMC
 - a. UL standard UL-6
 - b. ANSI C80-1
 - c. Federal Specification WW-C-581E
2. Electrical Metallic Tubing - EMT
 - a. UL standard UL-797
 - b. ANSI C80-3
 - c. Federal Specification WW-C-563
3. Flexible Steel Metal Conduit - FMC
 - a. UL standard UL-1
4. Liquid Tight Flexible Conduit - LFMC
 - a. UL Standard UL-360
5. Rigid Non-Metallic Conduit - RNC
 - a. UL Standard UL-651
 - b. ANSI Standard C33.91
 - c. Federal Specifications GSA-FSS and W-C1094-A
6. Wireways and Auxiliary Gutters
 - a. UL Standard UL-870
7. Armored Steel Cable – AC
 - a. UL Standard 1581
 - b. Federal Spec J-C-30B
8. Metal Clad Cable – MC
 - a. UL Standard 1581
 - b. Federal Spec J-C-30B

PART 2 - PRODUCTS

2.1 RACEWAY TYPES

A. Rigid Steel Conduit - RMC

1. Rigid steel conduit heavy wall galvanized.

B. Electric Metallic Tubing - EMT

1. Continuous, seamless tubing galvanized or sheradized on the exterior coated on the interior with a smooth hard finish of lacquer, varnish or enamel.
2. All couplings, connectors, etc., used in conjunction with this raceway which are 2 inch in size and smaller shall be watertight compression type. EMT fittings shall be malleable iron zinc coated. With conduits of 2-1/2 inch in size and larger, set screw type couplings are permitted.

C. Flexible Metal Conduit - FMC

1. Single strip, continuous, flexible interlocked double-wrapped steel, galvanized inside and outside forming smooth internal wiring channel.
2. Maximum length: 6 feet
3. Each section of raceway must contain a bonding wire bonded at each end and sized as required. Provide connectors with insulating bushings.

D. Liquid Tight Flexible Conduit - LFMC

1. Same as flexible steel conduit except with tough, inert watertight plastic outer jacket.
2. Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.

E. Armored Cable – AC – HCF 90

Health Care HCF 90

1. Type AC cable shall be armored, galvanized steel, sheath cable with copper conductors and THHN 90°C insulation. Furnish with #16 AWG integral bond conductor plus and insulated grounding conductor. Cable shall be installed in installations noted in NEC Articles #517 and #518.

F. Metal Clad Cable – MC

Non-Health Care

1. Type MC cable shall be armored galvanized steel sheath cable with copper conductors and THHN 90°C insulation. Furnish with insulated grounding conductor.

G. Rigid Non-Metallic Conduit - RNC

1. Composed of polyvinyl chloride suitable for 90 degrees C.
2. Raceway, fittings and cement must be produced by the same manufacturer who must have had a minimum of ten (10) years experience in manufacturing the products.
3. Materials must have a tensile strength of 7,000 – 7,200 psi and compressive strength of 9,000 psi.
4. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer. Install expansion fittings per NEC.

H. Wireways and auxiliary gutters

1. Of sizes and shapes indicated on the drawings and as required.
2. Provide all necessary elbows, trees, connectors, adaptors, etc.
3. Hinged cover secured with captive screws.
4. Wire retainers not less than 12 inches on center.

I. Duct banks

1. Provide duct banks as indicated on the drawings.
2. Reinforce duct banks with steel where such duct banks are positioned beneath roads and parking areas.
3. Concrete to be minimum 3,000 pounds per square inch.
4. Provide rigid steel raceway across all excavated and backfilled ditches and for a length of 10 foot from building and manhole walls. Pitch conduit away from building at every point where duct bank enters the building or equipment.
5. Support raceways installed in duct banks every 5 feet to assure correct alignment prior to placing concrete.
6. Terminate raceways with flared bells to enable ease of pulling cable and to eliminate stress on the cable. Free bells and raceway terminations of burrs and rough edges.
7. Provide concrete markers at grade where duct banks are stubbed out for future use.
8. Install duct banks not less than 30 inches below grade. Install 6" marking ribbon 12" below grade.

2.2 OUTLET, JUNCTION AND PULL BOXES

- A. Provide zinc-coated or cadmium-plated sheet steel outlet boxes not less than 4 inches octagonal or square, unless otherwise noted. Equip fixture outlet boxes with 3/8 inch no-bolt fixture studs where required. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide Series "GW" (Steel City) tile box, or as accepted, or a 4 inch square box with tile ring in masonry walls which will not be plastered or furred. Where drywall material is utilized provide plaster ring. Provide outlet boxes of the type and size suitable for the specific application.
- B. Construct junction or pullboxes not over 150 cubic inches in size as standard outlet boxes, and those over 150 cubic inches the same as "cabinets" with screw covers of the same gauge metal.
- C. Plug any open knockouts not utilized.
- D. Structurally secure all junction boxes with bar hanger support or approved equal in indoor locations where exposed to moisture and outdoor locations of cast metal with threaded hubs. Bracket types attaching to one stud with or without the bent tab are not acceptable.

PART 3 - EXECUTION

3.1 APPLICATION OF RACEWAYS

- A. The following applications must be adhered to except as otherwise required by Code. Raceways not conforming to this listing must be removed by this Contractor and replaced with the specified material at this Contractor's expense.

3.2 RACEWAY TYPES APPLICATION

Rigid Conduit - RMC	Application: Where exposed on exterior of building and exposed to mechanical injury, where specifically required, where required by codes and for all circuits in excess of 600 volts.
Electrical Mechanical	Electrical Metallic Applications: <u>Use EMT tubing in every instance - except where another tubing material is specified.</u>
Flexible Metal Conduit – FMC	Applications: Use in dry areas for connections to lighting fixtures in hung ceilings, connections to equipment installed in removable panels of hung ceilings at all transformer or equipment raceway connections where sound and vibration isolation is required.
Liquid Tight Flexible	Applications: Use in areas subject to moisture

Conduit - LFMC	where flexible steel is unacceptable at connections to all motors, and all raised floor areas.
Rigid Non-Metallic Conduit - RNC	Application: a. Schedule 40 - where raceways are in slab in below grade levels, for raceway duct banks. b. Schedule 80 - for underground raceways outside of the building which are not encased in concrete.
Armored Cable - AC HFC-90	Application: Use for branch circuit wiring above suspended ceilings or in metal stud walls. Cable shall not be run exposed. Home run wiring from panelboard to first outlet box shall be installed in conduit. AC cable not permitted for fire alarm wiring systems.
Metal-Clad Cable	application: use for branch circuit wiring above suspended ceilings or in metal stud walls. Cable shall not be run exposed. Home run wiring from panelboard to first outlet box shall be installed in conduit. Mc cable not permitted for fire alarm wiring systems.
Wireways and Auxiliary Gutters	Application: Where indicated on the drawings and as otherwise specifically approved.

3.3 RACEWAY SYSTEMS IN GENERAL

- A. Provide raceways for all wiring systems unless noted otherwise. Where non-metallic raceways are utilized, provide sizes as required with the grounding conductor considered as an insulated additional conductor. Minimum size 3/4 inch for home runs and 1 inch minimum for power distribution. Wiring of each type and system must be installed in separate raceways.
- B. Install capped bushings on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Raceways installed below or in floor slabs must extend a minimum of 4 inches above the finished slab to the first connector. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.
- C. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install 1-inch or larger raceways in or through structural members (beams, slabs, etc.) Only when and in the manner accepted by the architect. Draw up couplings and fittings full and tight. Protect threads from corrosion with one (1) coat red lead or zinc chromate after installation.
- D. Above Grade - Defined as the area above finished grade for a building exterior and above top surface of any slabs (or other concrete work) on grade for a building interior. Above-grade raceways to comply with the following:

1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of 6 inches from flues, steam pipes, or other heated lines. Provide flashing and counter- flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run embedded raceways in a direct line and, where possible, with long sweep bends and offsets. Provide sleeves in forms for new concrete walls, floor slabs and partitions for passage of raceways. Waterproof sleeved raceways where required.
 2. Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction.
 3. Provide one (1) empty 3/4 inch raceway for each three (3) spare unused poles or spaces of each flush-mounted panelboard. Terminate empty 3/4 inch conduit in a junction box, which after completion, is accessible to facilitate future branch circuit extension.
 4. Provide raceway installation (with appropriate seal-offs, explosion-proof fittings, etc.) In special occupancy area, as required. Provide conduit seal-offs where portions of an interior raceway system pass through walls, ceiling or floors which separate adjacent rooms having substantially different maintained temperatures, as in refrigeration or cold storage rooms.
 5. Protect raceway in earth or fill with two (2) coats of asphalt base paint. Touch up abrasions and wrench marks after conduit is in place.
 6. In lieu of the above, protect raceways with a minimum of 20 mil tape approved for the purpose and overlapped a minimum of one-half tape width.
 7. Provide drag wire in spare or empty raceways. Tag both ends of wire denoting opposite and termination location with black india ink on flameproof linen tag.
- E. Below Grade: Defined as the area below finished grade for a building exterior and below or within the bottom floor slab for a building interior. Below grade raceways to comply to the following:
1. Project below-grade raceways 2 inches minimum above floor or equipment foundation. Install exterior underground conduits 24 inches minimum below finished grade. Do not penetrate waterproof membranes unless proper seal is provided.
- F. No raceway may be installed in a concrete slab except with the permission of the Structural Engineer and with the written consent of the Owner. Conduits embedded in structural concrete slabs shall have the following minimum thickness and shall conform to the following.

<u>Raceway sizes</u>	<u>Min. Thickness of Concrete Slab</u>
3/4 in.	4-1/2 in.
1 in.	5 in.

1. Unless specifically approved in writing, raceways 1-1/4 inch size and larger shall not be installed in structural concrete slabs.
2. In no case will installation of raceways be permitted to interfere with the proper placement of principal reinforcement.
3. Raceways in structural slabs shall be placed between the upper and the lower layers of reinforcing steel. This will require careful bending of conduits.
4. Raceways embedded in concrete slabs shall be spaced not less than 8 inches on centers and as widely spaced as possible where they converge at panels or junction boxes.
5. Raceways running parallel to slabs supports, such as beams, columns and structural walls, shall be installed not less than 12 inches from such supporting elements.
6. To prevent displacement during concrete pour of lift slab, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured with suitable adhesives.

G. Rigid non-metallic conduit installations shall conform to the following:

1. All joints are to be made by the solvent cementing method using the material recommended by the raceway manufacturer. Fittings, cement and conduit shall be supplied by the same manufacturer.
2. Raceway cutoffs shall be square and made by handsaw or other approved means which does not deform the conduit. Raceway shall be reamed prior to solvent cementing to couplings, adapters, or fittings.
3. Electrical devices which are served by PVC raceways to be grounded by means of a ground wire pulled in the raceway.
4. Male box adapters shall be used for all box or raceway fittings to terminate plastic raceways.
5. Where separable terminations are required, they shall be made using PVC threaded adapters with locknuts or bushings. If such terminations must be watertight, "O" rings shall be installed.
6. Bends shall be made by methods that do not deform or damage the conduit. The radii of field bends shall not be less than those established by the NEC.
7. Raceway expansion fittings shall be provided in accordance with NEC. The position of the expansion fitting shall be adjusted proportional to the temperature at installation.
8. Raceway supports shall be installed in such a manner to allow the PVC conduit to slide through the supports as the temperature changes.
9. Elbows must be galvanized rigid steel.

10. Rigid non-metallic conduit is not permitted to be installed within the building.

- H. Raceways in hung ceilings shall be run on and secure to slab or primary structural members of ceiling, not to lathing channels or T-bars or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Install as high as but not less than 1'-0" above hung ceilings.
- I. Exposed raceways shall be run parallel or at right angles with building lines. Secure raceway clamps or supports to masonry materials by toggle bolts, expansion bolts, or steel inserts. Install raceway on steel construction with approved clamps, which do not depend on friction or set-screw pressure alone.
- J. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. This shall be done with ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt or similar material. This assembly may be pulled in together with, but ahead of the cable being installed. All empty raceways shall be similarly cleaned. Clear any raceway which rejects ball mandrel.
- K. Support less than 2" trade size, vertically run, raceways at intervals no greater than eight feet. Support such raceways, 2" trade size or larger, at intervals no greater than ten feet.
- L. Support less than 1" trade size, horizontally run, raceways at intervals no greater than seven feet. Support such raceways, 1" trade size or larger, at intervals no greater than ten feet.

3.4 WIREWAYS AND AUXILIARY GUTTER

- A. Wireways installed in hung ceilings shall be placed such that the cover will hinge upward from the side.
- B. 12" clear shall be provided from wireway cover when it is in the open position.

3.5 OUTLET, JUNCTION, AND PULLBOXES

- A. Provide outlet, junction, and pullboxes as indicated on the drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables. J-boxes and pullboxes shall be sized per NEC minimum.
- B. The exact location of outlets and equipment is governed by structural conditions and obstructions or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels equipment, etc., with Architect.
- C. Back-to-back outlets in the same wall or "thru-wall" type boxes not permitted. Provide 12-inch (minimum) spacing for outlets shown on opposite sides of a common wall to minimize sound transmission.

END OF SECTION 26 05 33

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 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. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
 - 3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For transformers, accessories, and components, from manufacturer.
- B. Qualification Data: For testing agency.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. Siemens Power Transmission & Distribution, Inc.

2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- 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. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.
 - 1. Coil Material: Copper.
- D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Cores: One leg per phase.
- D. Enclosure: Ventilated.
 - 1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
- E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.
- F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
- G. Insulation Class, Smaller than 30 kVA: 185 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.
- H. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150-deg C rise above 40-deg C ambient temperature.
- I. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
 2. Indicate value of K-factor on transformer nameplate.
 3. Unit shall meet requirements of NEMA TP 1 when tested according to NEMA TP 2 with a K-factor equal to one.
- J. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
 1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 2. Include special terminal for grounding the shield.
- K. Neutral: Rated 200 percent of full load current for K-factor rated transformers.

2.4 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- B. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.
- E. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
 - 1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- F. Secure transformer to concrete base according to manufacturer's written instructions.
- G. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.
- H. Remove shipping bolts, blocking, and wedges.

3.2 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.
- C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
 - 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 - 2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
 - 3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

3.4 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

SECTION 26 24 16 – PANELBOARD

PART 1 - GENERAL

1.1 REFERENCES

- A. The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following Specifications.
1. NEMA PB 1 - panelboards
 2. NEMA PB 1.1 - instructions for safe installation, operation and maintenance of panelboards rated 600 volts or less.
 3. NEMA AB 1 - molded case circuit breakers
 4. UL 50 - enclosures for electrical equipment
 5. UL 67 - panelboards
 6. UL 489 - molded-case circuit breakers and circuit breaker enclosures
 7. CSA Standard C22.2 No. 29-M1989 - panelboards and enclosed panelboards
 8. CSA Standard C22.2 No. 5-M91 - molded case circuit breakers
 9. Federal Specification W-P-115C - Type I Class 1
 10. Federal Specification W-C-375B/GEN - circuit breakers, molded case, branch circuit and service.
 11. Federal Specification W-C-865C - fusible switches
 12. NFPA 70 - National Electrical Code (NEC)
 13. ASTM - American Society of Testing Materials

1.2 SUBMITTAL AND RECORD DOCUMENTATION

- A. Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

1.3 QUALIFICATIONS

- A. Company specializing in manufacturing of panelboard products with a minimum of fifty (50) years documented experience.
- B. Panelboards shall be manufactured in accordance with standards listed Article 1.02 - references.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inspect and report concealed damage to carrier within their required time period.
- B. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.
- C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.5 OPERATIONS AND MAINTENANCE MATERIALS

- A. Manufacturer shall provide installation instructions and NEMA standards publication PB 1.1
- B. Instructions for safe installation, operation and maintenance of panelboards rated 600 volts or less.

1.6 WARRANTY

- A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (2) year from the date of installation or eighteen (18) months from the date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. ESL Power Systems, Inc.
 - 3. General Electric Company; GE Energy Management – Electrical Distribution.
 - 4. Siemens Energy.

2.2 PANELBOARD

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.
- B. Panelboard Short Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
- C. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.3 POWER DISTRIBUTION PANELBOARDS

- A. Panelboard
 - 1. Interior
 - a. Shall be panelboard rated for 480 vac maximum. Continuous main current ratings as indicated on associated schedules and/or drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.
 - b. Provide UL listed short circuit current ratings (SCCR) as indicated on the associated [schedules] [drawings] not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 rms symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as service equipment when application requirements comply with UL 67 and NEC Articles 230.VI and VII.
 - c. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two (2) u-shaped steel channels, permanently secured to a galvanized steel-mounting pan by fasteners.
 - d. Interior trim shall be of dead-front construction to shield user from all energized parts.
 - e. A solidly bonded [copper] equipment ground bar shall be provided.
 - f. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. UL listed panelboards with 200% rated solid neutrals shall have plated copper neutral bus for non-linear load applications. Gutter-mounted neutral will not be acceptable.
 - g. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL listed label, and

short circuit current rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.

2. Group mounted circuit breakers through 600a
 - a. Circuit breaker(s) shall be group mounted with mechanical restraint on a common pan or rail assembly.
 - b. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 - c. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
3. Thermal magnetic molded case circuit breakers
 - a. Molded case circuit breakers shall have integral thermal and instantaneous magnetic trip in each pole.
 - b. Circuit protective devices shall be molded case circuit breakers. Circuit breakers shall be standard interrupting. Ampere ratings shall be as shown on the drawings.
 - c. Manufacturer shall submit one set of published IP and I²T let-through curves (as required by UL) to the Owner.
4. Enclosures
 - a. Type 1 boxes
 - 1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvanized steel will not be acceptable.
 - 2) Boxes shall have removable blank end walls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.
 - b. Type 1 trim fronts
 - 1) Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI medium gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) Trim front shall be hinged 1-piece with door available in flush and surface mount as indicated on drawings. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.
 - 3) Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

2.4 LIGHTING AND APPLIANCE PANELBOARD TYPE

A. Panelboard

1. Interior
 - a. Shall be panelboard rated for 480 vac maximum. Continuous main current ratings, as indicated on associated schedules and/or drawings, not to exceed 600 amperes maximum.
 - b. Minimum short circuit current rating: 42,000 or as indicated in rms symmetrical amperes.

- c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-in or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be copper. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as service equipment when application requirements comply with UL 67 and NEC Article 230.
 - d. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
 - e. A solidly bonded copper equipment ground bar shall be provided.
 - f. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. [UL listed panelboards with 200% rated solid neutral shall be plated copper for non-linear load applications. Panelboards shall be marked for non-linear load applications].
 - g. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused
 - h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
2. Main circuit breaker
- a. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40° C ambient environment. Thermal elements shall be ambient compensating above 40° C.
 - b. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
 - c. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings.
 - d. Circuit breaker escutcheon shall have international i/o markings, in addition to standard on/off markings. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
 - e. Lugs shall be UL listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable.
 - f. The circuit breakers shall be UL listed for use with the following accessories: shunt trip, under voltage trip, ground fault shunt trip, auxiliary switch, alarm switch, mechanical lug kits, and compression lug kits.
3. Branch circuit breakers
- a. Circuit breakers shall be UL listed with amperage ratings, interrupting ratings, and number of poles as indicated on the associated schedules and/or drawings.

- b. Molded case branch circuit breakers shall have bolt-on type bus connectors.
 - c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
 - d. The exposed faceplates of all branch circuit breakers shall be flush with one another.
 - e. Lugs shall be UL listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16.
4. Enclosures
- a. Type 1 boxes
 - 1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvanized steel will not be acceptable.
 - 2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - 3) Box width shall be 20" wide.
 - b. Type 1 fronts
 - 1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 61 gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) Fronts shall be hinged 1-piece with door. Mounting shall be as indicated on associated schedules and drawings.
 - 3) Panelboards shall have mono-flat fronts with concealed door hinges and mounted with trim screws. Front shall not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.
 - 4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A directory cardholder shall be mounted on the inside of door.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.

3.2 FIELD QUALITY CONTROL

- A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION 26 24 16

SECTION 26 28 16 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide disconnect switches in accordance with the Contract Documents.

1.2 STANDARDS

- A. Except as modified by governing codes and by the contract documents, comply with the latest provisions and latest recommendations of the following:
 - 1. UL standards #98 (file #4776) and #508.
 - 2. Federal Specification W-S-865C.
 - 3. NEMA standard KSI-1975.
 - 4. UL 20 and Federal Specification test standards for toggle switches.

1.3 SUBMITTALS

- A. Submit manufacturers' data for all disconnect switches.

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

- A. Heavy-duty, single-throw knife switch with quick-make, quick-break mechanism, capable of full load operations, shall meet NEMA and U.S. government specifications for Class A switches.
- B. Provide with contact arc-quenching devices, such as magnetic blowouts or snuffing plates. Provide self-aligning switchblades with silver alloy contact areas and designed so that arcing upon making and breaking does not occur on the final contact surfaces. Provide with high-pressure, spring-loaded contact. Mount switch parts on high-grade insulating base.
- C. Enclosure: NEMA I with hinged door, and defeatable interlock when switch is in "on" position and can be positively padlocked in "on" and "off" positions. Utilize NEMA 3R (rain-tight) enclosure for exterior installations. NEMA 3R enclosures must be galvanized.

- D. Size, fusing and number of poles as shown or as required. Where fused, the devices must be provided with UL listed rejection feature to reject all but Class R fuses. Provide horsepower rated switch to match motor load if no size is shown. Use 3 pole plus solid neutral switches on four wire circuits and 3 pole switches on all other circuits unless otherwise noted.
- E. Lugs must be UL listed for aluminum and/or copper conductors and be front removable.
- F. Manufacturer to be the same as that for transformers, switchgear, etc.
- G. Acceptable manufacturers: Square D (No Substitutions).

2.2 TOGGLE TYPE MANUAL CONTROL SWITCHES

- A. Provide switches that operate at their full rating with fluorescent, tungsten, and resistance loads - and at 80% of their rated capacity with motor loads.
- B. Switches to be heavy duty and have:
 - 1. Arc-resisting bodies.
 - 2. Slow make-and-break mechanisms,
 - 3. Silver alloy contact buttons.
 - 4. Side or back wiring with up to no. 10 AWG solid conductors.
- C. Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. ESL Power Systems, Inc.
 - 3. General Electric Company; GE Energy Management – Electrical Distribution.
 - 4. Siemens Energy.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Each piece of equipment utilizing multi-phase power shall be supplied with a safety-type disconnect switch.
- B. Each piece of equipment utilizing single-phase power but protected at over 30 amperes shall be supplied with a safety-type disconnect switch.
- C. Equipment other than mentioned above may utilize a toggle type manual control switch properly sized and rated for the equipment it disconnects.

- D. Factory installed disconnect switches may be used to satisfy the above requirements with the Architect's prior approval.

3.2 MOUNTING

- A. Disconnect switches shall be mounted on adjacent wall or from the floor with independent supports unless indicated otherwise on drawings.
- B. Disconnect switches shall be mounted on adjacent wall or from the floor with independent supports. Switches shall not be mounted on fan housing.

END OF SECTION 26 28 16

SECTION 26 28 17 - EQUIPMENT CONNECTIONS AND COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: Provide final connections to equipment and coordinate same in accordance with the contract documents. Reference shall be made to "Electrical General Provisions" for contractor's responsibility for verification of equipment furnished by others.
- B. Equipment to receive final connections shall include but not be limited to the following:
 - 1. Mechanical equipment
 - 2. Appliances
 - 3. Miscellaneous equipment
 - 4. Owner furnished equipment

1.2 EXAMINATION OF DOCUMENTS

- A. Prior to the submitting of bids, the Contractor shall familiarize himself with all conditions affecting the proposed installation of equipment requiring electrical connections and shall make provisions as to the cost thereof. Failure to comply with the intent of this paragraph shall in no way relieve the Contractor of performing all necessary work required for final electrical connections and equipment.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 NOT USED

PART 4 - MECHANICAL EQUIPMENT

4.1 MECHANICAL EQUIPMENT

- A. All power wiring and connections for all motors including starters, controllers, and breakers as indicated on the drawings and the riser diagrams shall be furnished and installed under this Section of the Specifications.
- B. Motors shall be connected in a neat and skillful manner. Ones delivered with terminal boxes that are inadequate shall be equipped with special boxes that suit the conditions.
- C. In general, rigid conduit or tubing shall be used, but motors that require movement or ones that would transmit vibration to conduit shall be wired with liquid tight flexible steel conduit not over 18" long.
- D. All motors shall be grounded with a green covered ground wire run inside the conduit and connected to motor frame on one end and to grounding system on the other end.
- E. Motors and their starters not located in the motor control center are only approximately located on the Drawings and the Contractor shall allow for the relocation that developed conditions may demand. The motor control center is specified in Division 23 of the Specifications.
- F. The location of motors, starters and control equipment and the arrangement to be followed shall be determined on the job jointly by the Contractor whose equipment is involved, this Contractor and the Architect.
- G. Starting equipment shall be either wall mounted or free standing, as best suits conditions. If free standing, this Contractor shall make and install a suitable frame structural steel to accommodate it.
- H. Furnish and install one motor snap switch of the proper size for disconnect of each single phase motor indicated on the Drawings.
- I. This Contractor shall be responsible for verifying the proper rotation for three phase motors.
- J. The equipment supplier shall be responsible for verifying the proper rotation for single phase motors.

4.2 CONTROL WIRING

- A. Control wiring for HVAC and plumbing equipment will be furnished and installed by plumbing and HVAC contractor as specified in Division 23.
- B. All control wiring in Division 23 is the responsibility of the Contractor who provides the particular equipment. Control wiring includes the providing of all required motor controls, relays, pilot devices, all related raceway systems, all related conductors and all final connections other than three phase power connections.
- C. For single phase equipment provided under HVAC and plumbing contracts, this Contractor shall provide single phase feeders and make final connection.
- D. All other control wiring required by other Divisions of the Specifications shall be furnished and installed by this Contractor. Unless specifically indicated on the Drawings or specified hereinafter to the contrary, all control devices such as starters, pushbuttons, limit switches, etc.,

are furnished under other Divisions of the Specifications. This Contractor shall receive and store all electrical equipment to be installed by him. Conduit layout and arrangement of control wiring shall be done by this Contractor.

4.3 EQUIPMENT CONNECTIONS

- A. This Contractor shall make final connections to all mechanical equipment.

END OF SECTION 26 28 17

SECTION 26 43 13 - INTEGRATED TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICE(S) PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description

1. This Section describes the materials and installation requirements for integrated surge protective devices (SPD) in panelboards.

PART 2 - PRODUCT

2.1 SURGE PROTECTIVE DEVICE

A. Integral surge suppressor

1. SPD shall be listed and component recognized in accordance with UL 1449 second edition to include section 37.3 highest fault current category. SPD shall be UL 1283 listed.
2. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.
3. The TVSS devices in lighting and appliance panelboards shall be bus mounted between the main and branch devices. TVSS devices bussed off the end of the panelboard are not allowed. Panelboards with TVSS will accommodate thru-feed lugs and sub-feed circuit breakers in single section and multi-section panelboards.
4. The TVSS device in power distribution panelboards shall be plug on bus connected.
5. SPD shall provide surge current diversion paths for all modes of protection; I-L, I-N, L-G, N-G in Wye systems.
6. TVSS shall safely reach an end-of-life condition when subjected to fault current levels between 0 and 200 ka, including low level fault currents from 5 to 5000 amperes.
7. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided.
8. SPD shall meet or exceed the following criteria:
 - a. Minimum surge current capability (single pulse rated) per phase shall be:
 - 1) Service entrance panelboard locations: 240ka per phase

- 2) Distribution and lighting and appliance panelboard locations: 160ka per phase
- b. UL 1449-2 suppression voltage ratings:

Voltage	Location	l-l	l-n	l-g	n-g
480y/277v	Distribution:	2000v	1200v	1200v	1200v

- 9. SPD shall be provided with one set of N.O./N.C. dry contacts.
- 10. The manufacturer of the electrical equipment in which the TVSS is installed shall warrant the integrated TVSS device to be free from defects in material and workmanship for a period of ten (10) years from the date of invoice by Square D (Approved Equal) or its authorized sales channel.

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. ESL Power Systems, Inc.
 - 3. General Electric Company; GE Energy Management – Electrical Distribution.
 - 4. Siemens Energy.

END OF SECTION 26 43 13

SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section includes, but is not necessarily limited to, the furnishing and installation of all lighting as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the work.
 - 1. Major items:
 - a. Interior lighting fixtures.
 - b. Exterior lighting fixtures.
 - c. Emergency lighting.
 - d. Exit lighting.
 - e. Lighting controls.
 - f. Lighting poles, supports and bases.
 - g. Lamps installed in fixtures.
 - h. Adequate fixture supporting systems.

1.2 REFERENCES

- A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
 - 1. ANSI-UL standards
 - a. 924 - emergency lighting and power equipment.
 - b. 935 - fluorescent lamp ballasts
 - c. 1570 - fluorescent lighting fixtures
 - d. 1571 - incandescent lighting fixtures
 - e. 1572 - high intensity discharge fixtures
 - 2. NFPA
 - a. 70 - NEC
 - b. 101 - Life Safety

1.3 FIXTURE SCHEDULE

- A. The lighting equipment specified herein has been carefully chosen for its ability to meet luminous performance requirements of this project. Substitutions will only be accepted from the "approved equals" portion of the lighting fixture schedule. No exceptions.
- B. When only one manufacturer is listed within the description of the luminaire, the design engineering of Architectural aesthetics will not allow substitution of another manufacturer. the

Contractor shall provide a separate list of unit costs for these luminaries with Shop Drawings. Shop Drawings will not be reviewed without unit cost information.

- C. Once bids, Shop Drawings, are approved, all lighting is to be ordered in a timely manner. the Contractor is then to inform the Engineer immediately, in writing, the date when equipment orders are completed and delivery scheduled.

1.4 SUBMITTALS

- A. Submit Shop Drawings and manufacturers' data for the following items in accordance with the conditions of the contract and as specified below.
 - 1. Major luminaries and special luminaries shall show full size cross sections. Indicate finished dimensions, metal thicknesses, and materials.
 - 2. Show mounting details, including hung ceiling construction.
 - 3. Indicate type of ballast and manufacturer and ballast quantity and location. Include information as to power factor, input watts, and ballast factor.
 - 4. Shop Drawings shall include a complete listing of all luminaries on a single sheet. This listing of shall contain the luminaire type, manufacturer's catalog number, applied voltage, lamps and ballasts.
 - 5. Submit manufacturer's fixtures and accessories Shop Drawings and data in booklet form, including rough-in dimensions, instructions for installation and maintenance.

1.5 PROTECTION

- A. Protect lighting fixtures and work against dirt, water or mechanical damage before, during, and after installation. Damage prior to final acceptance shall satisfactorily be repaired or replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND FIXTURES

- A. General:
 - 1. Provide all lighting fixtures in accordance with lighting fixture schedule and as indicated and required on Drawings.
 - 2. Fixture catalog numbers only indicates type and style. Provide each fixture complete with proper fixture trim, levelers, mounting brackets, flanges, plaster rings, glassware, and accessories for complete installation as required for type of ceiling and room finish schedules.

3. All plastic diffusers used in lighting fixtures shall be manufactured of 100 percent virgin acrylic plastic.
4. Provide approved enclosures where recessed in fire rated ceilings.
5. Provide gaskets as required to prevent light spill between frames and ceilings.
6. Provide "wet" labels on all fixtures installed outdoors or in moist areas.
7. Provide continuity of ground on all fixtures used as raceways and mounted end to end.
8. All metal parts to be chemically treated with a rust resistant phosphatized solution,
9. Provide luminaries, completely factory-assembled and wired and equipped with necessary sockets, ballasts, wiring, shielding, reflectors, channels, lenses, etc., and deliver to job ready for installation.
10. Parabolic Luminaire Care: Parabolic luminaries to be installed with mylar cover over louvers. Cover shall be u.l. listed for temporary lighting. Upon completion of work, remove mylar cover with white glove and blow clean reflectors.
11. Finish: Porcelain or baked enamel finish matte white on interiors with minimum test reflectance of 90% matte white finish or as specified in visible exterior. Thoroughly clean base metal and bonderize after fabrication.
12. Sockets: Incandescent lamp socket -- porcelain housings over copper screw shells, with medium base sockets rated at 660 watts and 250 volts. Insulating joint in pull chains. Fluorescent lampholder -- white, heat-resistant plastic rated 660 watts and 600 volts. Fluorescent industrial sockets--heavy-duty sockets for HID luminaries where mounted less than 8'-0" aff.
13. Luminaire Wiring: Minimum individual luminaire wiring -- number 18 gauge with insulation with rated operating temperature of 105 degrees centigrade or higher. Terminate wiring for recessed luminaries, except fluorescent units, in an external splice box.
14. Recessed incandescent luminaries shall be furnished with thermal protection in accordance with Article 410.65 of the NEC.
15. Where installed outdoors, in garage areas or in spaces open to the exterior, provide each fluorescent lamp with an OSHA approved tube guard as manufactured by mcgill manufacturing company. Tube shall have 96% transmission properties.
16. Where utilized as raceway, luminaries shall be suitable for use as raceways. Provide feed through splice boxes where necessary. Wiring shall be rated for 90 degrees centigrade.

B. Lamps:

1. Provide lamps in all fixtures and lamp outlets of proper type voltage and wattage required for fixtures and indicated in fixture schedule or as indicated on Drawings.

2. All fluorescent lamps shall be Phillips, General Electric, or equal by Sylvania. All lamps shall be provided by a single manufacturer.
3. Contractor will provide 25% replacement lamps to the Owner of all lamp types upon completion of the job. Provide a typewritten label for each fixture with lamp ordering code number for future maintenance. Locate the label so that it cannot be seen from normal viewing angles.
4. Incandescent 'a' lamps shall be extended service type inside frosted rated at 130 volts.

C. Ballasts (Fluorescent and Compact Fluorescent):

1. All ballasts for T8, T5 and T5 high output lamps shall be of the high frequency electronic type.
2. Ballasts shall carry the UL label for intended use, ETL certification and "A" sound rating, and be equipped with an internal, automatic, resetting thermal protection system (Class "P").
3. High-intensity discharge ballasts shall be constant wattage auto-transformer type with built-in thermal protection unless otherwise specified. Power factor rating for fluorescent and HID ballasts shall be 90% minimum.
4. Metal halide universal voltage ballasts for 39w, 70w, 100w and 150w lamps shall be electronic type with a power factor greater than 95%, current thd < 10%, ballast factor 1.0, current crest factor of 1.2 and current frequency greater than 130hz as manufactured by Aromat.
5. Ballasts shall be manufactured by Motorola, Universal, Advance, or approved equivalent. All ballasts for each lamp type shall be of the same manufacturer.
6. Fluorescent lamp ballasts shall be high frequency electronic type, instant start-general applications, program rapid start-controlled circuits and T5 lamps, and operating lamps at a frequency of greater than 20 khz with no detectable flicker.
7. Contractor is to replace ballasts that the Architect or occupant states are unduly noisy, at no cost to the Owner.
8. All remote stepdown transformers shall be properly wired to fixtures so as to completely eliminate voltage drop, regardless of transformers location.
9. Parallel lamp connection where available.
10. Current THD < 20%, current thd < 10% for compact fluorescent.
11. Current crest factor = 1.7 or less.
12. Ballast factor of minimum .88.
13. All electronic ballasts for fluorescent lamps with a diameter of T5 or less shall be provided with shut down circuitry that will interrupt power to the lamp at end of life.

14. The conductors between ballasts and lampholders shall have an approved insulation for 1000 volts. This includes conductors to and from remote ballasts.
15. Ballasts for control of lamps in one housing or fixture until shall not control lamps of an adjoining unit, except as otherwise noted.
16. Electronic ballasts shall be covered by a five-year full service warranty for replacement ballast and labor. All other ballasts shall be covered for one full year and one year pro-rated as per standard manufacturer's warranty against defects. Guarantee to include labor for replacing defective ballast with new ballast.

D. Fusing

1. All HID fixtures shall be completed with a fuse in each phase conductor, located within the fixture.

E. Emergency lighting

1. Emergency lighting systems shall be as indicated in Drawings, complete with all equipment, including fixtures, lamps, batteries, conduit, boxes and wiring.
2. This equipment is to provide instantaneous emergency lighting in the event of a power failure by means of batteries controlled by solid state controls.
3. Where indicated on fixture schedule and/or on Drawings, provide emergency ballasts in light fixtures. The emergency ballasts shall consist of a high-temperature, maintenance-free nickel-cadmium battery and electronic circuitry contained in a red metal case. A solid-state charging indicator light to monitor the charger and battery, a double-pole test switch, and installation hardware shall be provided. The emergency ballast shall be capable of operating one fluorescent lamp at 1100 to 1400 lumens initial light output in the emergency mode for a minimum of 90 minutes. The ballast shall meet or exceed emergency standards set forth by the NEC and shall be UL listed for installation inside, on top of, or remote from the fixture. It shall be warranted for a full five years from the date of purchase. Ballasts shall be Model B50 as manufactured by Bodine or an approved equal.

F. Exit lighting

1. Exit lighting system shall be as indicated on Drawings.
2. Equipment shall be complete with lamps.
3. Where indicated as such, provide battery pack and charge for illumination under power failure conditions.
4. Equipment shall meet boca, OSHA, NFPA and NEC illumination standards.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. General

1. Examine architectural and other pertinent details and ceiling and wall construction and finish being installed.
2. Lighting fixture catalog numbers and mounting indicated on the Electrical Drawings are for general bidding information only.
3. It shall be the Contractor's responsibility to determine what suspension or mounting method is required and provide fixtures complete with all trim, flanges, brackets, levelers, etc. Required for mounting at the location indicated.

3.2 BASIC INSTALLATION METHODS AND MATERIALS

A. General

1. Install outlets, surface mounted, recessed or semi-recessed fixtures to maintain the alignment, spacings, layout and general arrangements indicated in the Drawings. Obtain approval of Engineer for all changes in layout required to avoid interferences with other trades.

B. Coordination:

1. Work incorporating with ceiling trades in locating and framing recessed fixtures in acoustical tile pattern or grid system to conform to layout.
2. Inform affected trades of the location and framing details necessary for the installation of flush fixtures and deliver all framing rings of these fixtures that become a part of the ceiling construction.
3. Before equipment is ordered, electrical contractor to review luminaire and ceiling mechanical compatibility in each area and verify luminaire on the Drawings. Contractor shall be responsible for all fixture quantities, lengths and clearances
4. Required and shall inform the Architect of the job conditions at variance with the fixture(s) specified or detailed which affect installation or location. (all stages of installation).
5. Mechanical and electrical contractors are to review and coordinate lighting locations in relationship to mechanical systems to minimize conflicts prior to installation. Electrical Contractor is to submit a written memo with minutes of these meetings to both the Architect and Engineer.
6. This Contractor is responsible for coordinating the characteristics and the UL labeling of the luminaries and their components with the ambient conditions which will exist when the luminaries are installed. No extra compensation will be permitted for failure to coordinate the luminaries with their ambient conditions.

C. Mounting and supports

1. Install luminaries in mechanical and unfinished areas after ductwork and piping installation. Locate fixtures 8 feet 6 inches above the floor, or at suitable locations within space on walls but not lower than 7'-0" aff. Where mounted lower than 8'-6" luminaries shall be protected by an approved wire guard.
2. Where fluorescent luminaries are surface mounted, they shall be labelled for such and a minimum of one-half (1/2) inch air space and shall be maintained between top of luminaire and mounting surface by an approved means.
3. Pendant mounted units shall comply with the following:
 - a. Where luminaries are mounted in a continuous row, luminaries, eight feet in length shall have stems placed within 2'-0" apart. Stems shall be spaced symmetrically. A fixture, four feet or three feet in length, placed in a row, shall have a stem connected to center luminaire.
 - b. Individual luminaries, four feet in length, shall have two stems placed approximately 3 inches from each end.
 - c. Individual luminaire, three feet in length, shall have dual stems and a single canopy.
 - d. Each stem shall have a brass or steel swivel or other self-aligning device of type approved by the Architect/Engineer.
4. Where luminaries are mounted on surface-mounted outlet boxes in surface mounted conduit runs, this contractor shall furnish and install a luminaire canopy sufficiently deep to permit exposed conduits to pass through. Canopy shall have proper openings cut by luminaire manufacturer through which conduits may pass. Submit sample of canopy for approval before installation.
5. Prior to final payment, this contractor shall clean all luminaries and replace all lamps. He shall also touch up all scratch marks, etc. In an approved manner.
6. Provide a minimum of two support points for all surface, pendant or recessed mounted luminaries. The supports shall be tied to the building structural system. The support points shall be totally independent of the ceiling system.
7. Recessed luminaries to be installed in metal panel or acoustic modular ceilings shall be modified as required to fit into openings in ceiling construction. This contractor shall coordinate and verify this work with the general construction contractor. Shop Drawings showing details shall be submitted for approval.
8. All luminaries hung ceilings are to be installed with earthquake clips.

D. Emergency systems raceway and hook-up

1. Circuit wiring for the emergency systems shall be installed in separate raceway and kept entirely independent of all other wiring and equipment.
2. Replace all burned out incandescent and dimmed lamps.

3.3 ADJUSTING AND CLEANING

A. At project completion, before final approval:

1. Aim adjustable fixtures as directed and observe and adjust at night as required.
2. Clean interior of all fixtures, all lens and lamps.

END OF SECTION 26 51 00

SECTION 27 05 01 - TELEPHONE RACEWAYS AND ACCESSORIES PART 1 - GENERAL

PART 1 - DESCRIPTION

1.1 DESCRIPTION

- A. General: Provide raceways and accessories for telephone systems in accordance with the Contract Documents.

1.2 STANDARDS

- A. Except as modified by governing codes and the contract documents comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Local telephone company regulations.
- B. The contractor shall contact the local telephone company and the local Installer to coordinate all telephone work. Any deviations from the contract documents shall immediately be brought to the attention of the Architect.

PART 2 - PRODUCTS

2.1 RACEWAY

- A. E.M.T. shall be utilized for all telephone raceway within buildings except as otherwise noted.
- B. P.V.C. shall be utilized for underground raceways. If PVC is utilized, 90 degree elbows shall be PVC coated GRC. underground PVC conduit shall be encased in 3" concrete.

PART 3 - EXECUTION

3.1 RACEWAY SYSTEM

- A. Install capped bushings on raceways as soon as installed.
- B. Raceways below grade shall be installed at 24 inches minimum below the finished grade.
- C. Arrange raceway runs less than 100 feet from point to point so that they contain no more than 2-90 degree standard factory bends or 3-90 degree 24 inch radius bends. Provide pull boxes in raceway runs exceeding 100 feet from point to point with more than 1-90 degree bend. Raceway runs shall not contain square or oval conduit fittings ("condulets"). Enter feeder raceways to telephone terminal boards top or bottom on the extreme right or left side.

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3.2 OUTLET AND PULLBOXES

- A. Provide outlet pullboxes as indicated on the drawings and as required for the complete installation of the telephone system.
- B. Pullboxes shall be provided where 3-90 degree bends are exceeded with a single conduit run.

3.3 RECEPTACLES

- A. Provide a double duplex receptacle at each telephone terminal mounted at 7'-0" A.F.F at the right hand side of the backboard.

END OF SECTION 27 05 01